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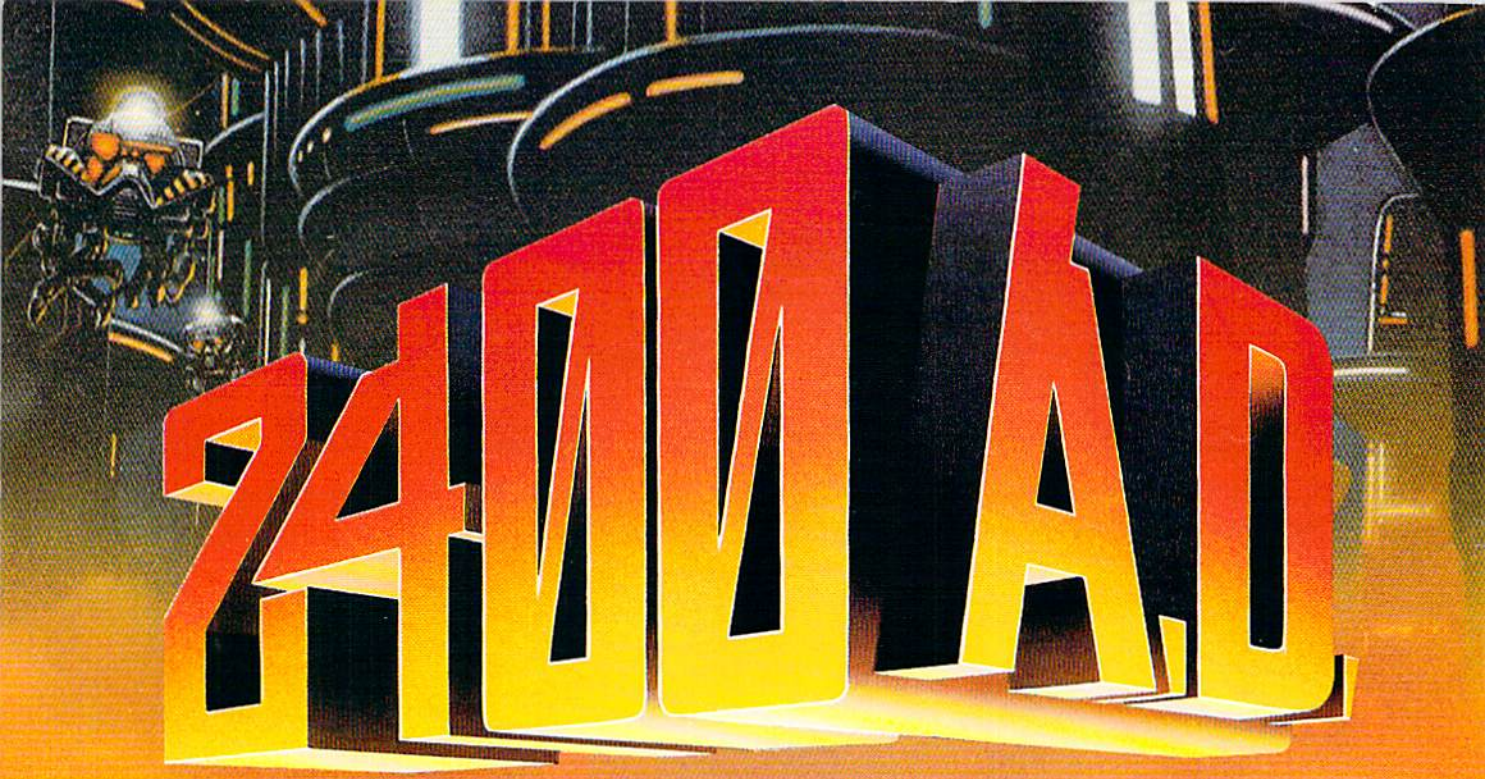

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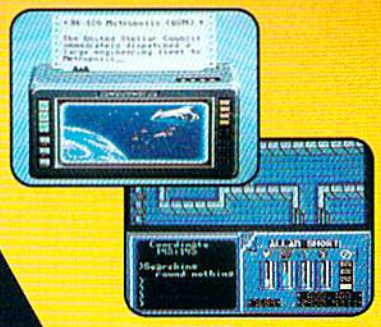

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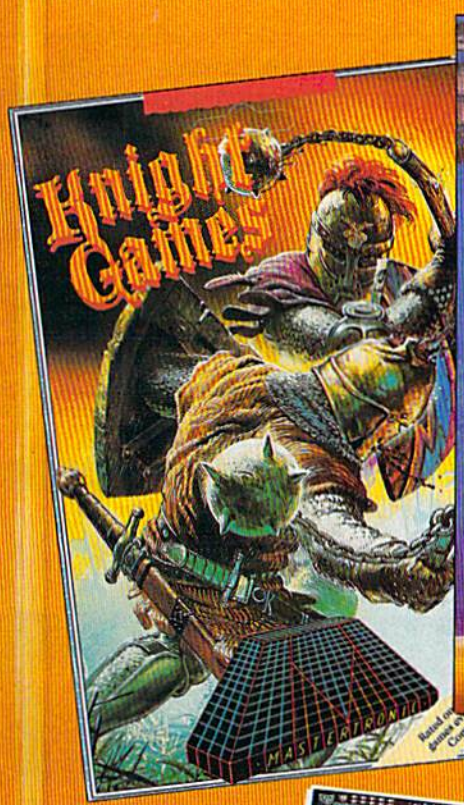

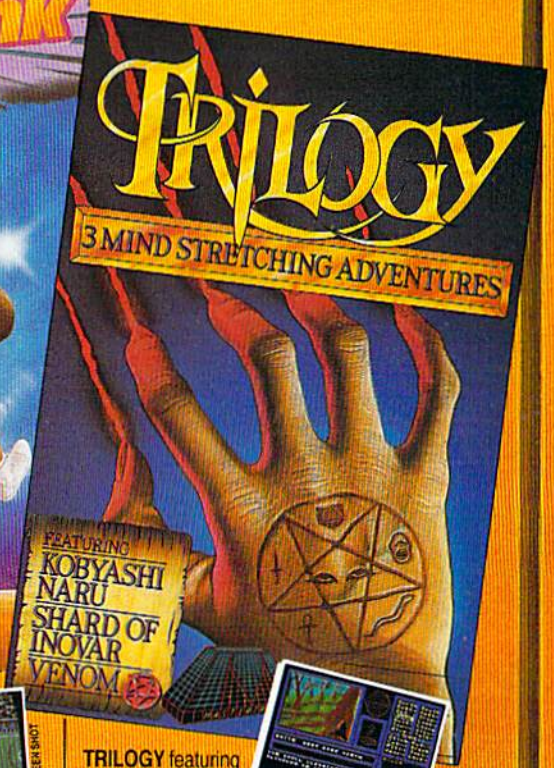

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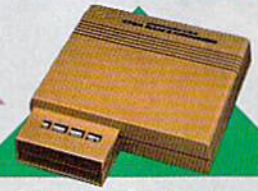

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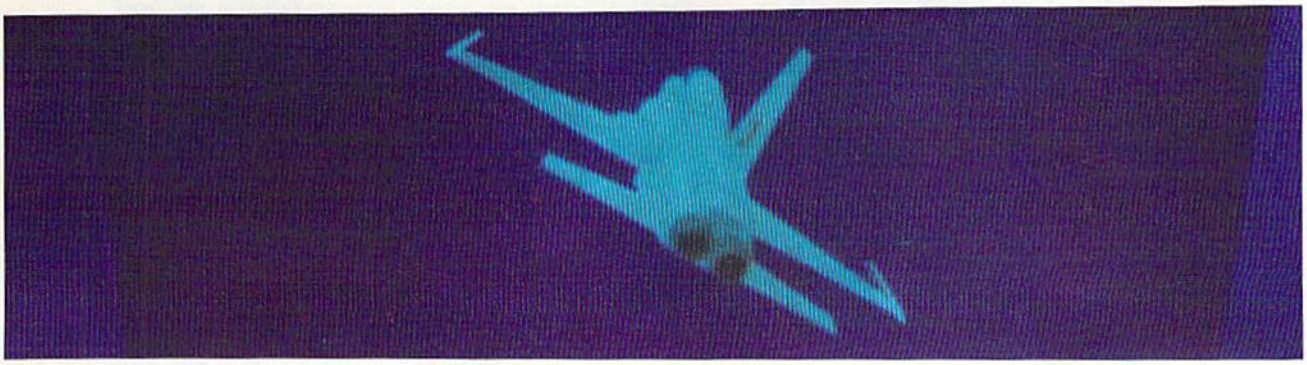

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Cover photograph by Ted Horowitz

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EDITOR'S notes

We recently had the pleasure of attending the annual World of Commodore show in Toronto. At the COMPUTE! booth, we stayed busy (Toronto is a hotbed of Commodore activity), talking with Canadian *Gazette* readers and showing several of our disk specialty products *(SpeedScript, Best of Gazette, Amiga Games,* and *5-Year Indexer)* on the monitors strewn across our booth countertop. We were giving away complimentary copies of *Gazette,* as we usually do at the various shows we attend.

On the second day of the show, a reader stopped by and told me how much he liked *Gazette,* explaining how he had read every issue from the beginning. He then began to talk about some of his favorite *Gazette* programs as though I had been with COMPUTE! for only a few weeks. ("Have you heard of *SpeedScript?*" "Did you know *Gazette* used to publish programs for the VIC-20?") I told him that I *should* know these things because I've been editor of *Gazette* since 1983. He looked at me with a crooked eye and asked my name. When I told him, he said sheepishly, "Oh, I do read the whole magazine, but I never look at names."

A short while later, another *Gazette* reader stopped by and told me he had just purchased an Amiga. Would we be having an Amiga magazine? I told him we would and asked if he'd like to add his name and address to a sign-up list we were compiling for those interested. He filled in the information and handed the list back to me. I glanced at the name: Walter Holowatenko. I tried pronouncing it. "Very good! You got it right," exclaimed Walter. I said that I usually noticed unusual last names since I had one. He asked what it was. When I told him, his eyes widened. "You're Lance Elko?" I nodded apprehensively, expecting a verbal dressing-down or a quick right to the chin in repayment for some elusive *Gazette* program bug that had plagued Walter for years. He extended his hand and smiled from ear to ear. "Wow! I read you all the time, have for years. I really enjoy your stuff." Walter was delighted, and I was both honored and relieved.

As Walter walked away, it struck me how diverse our readership, and the Commodore user community at large, really is. Some people read names; some don't. Some program; some don't. Some love GEOS; others loathe it. Some play computer games, while others think they're a waste of time. Nowhere is this reflected better than in the mail we receive, the people we talk to at shows, and in the annual (December) "*Gazette* Readership Survey." (Next month, we'll look at the most interesting results from the survey.)

What makes this diversity possible is the huge number of Commodore users. We're a representative slice of the real world, where we have artist and accountant, conservative and liberal, atheist and believer, and everything in between. A sixties slogan comes to mind: *Different strokes for different folks.* The wide spectrum of diversity in taste and preference is what makes for a colorful, fascinating world, and the Commodore community is no exception.

Lance Elko
Senior Editor

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LETTERS to the editor

Send questions or comments to Letters to the Editor, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We reserve the right to edit letters for clarity and length.*

Q-Link Correction

I enjoyed your article "A Guided Tour of Major Online Services" (January). However, an error in the last sentence of the Q-Link discussion has caused concern here in the office and among our membership. Our charge for selected Plus services is actually *eight* cents a minute, rather than six. As a result of this mistake, our customer relations department has been fielding dozens of calls from subscribers asking if we are planning to lower the price of our Plus charges or asking why they are being billed at the wrong rate. We at Quantum would appreciate it if you would help us clear up the confusion.

Marshall Rens
Editor, Q-Link Update
Vienna, VA

Let's Go, People!

I can't believe the response to the GEOS Programming Contest, or, more precisely, the lack of it. I noticed that in the list of winners, there were seven spots with "no entry" in them. Let's go, people! If the guys at *Gazette* and Berkeley are good enough to put together a contest, enter it! According to the last readership survey ("Editor's Notes," May 1988), nearly 50 percent of the readers use GEOS, 80 percent program, 20 percent of those who program use ML, and let's say half of the ML programmers program well. My math tells me that close to 9000 people should have entered (assuming *Gazette* has about 200,000 readers)! I really hope that if *Gazette* sponsors another contest, more people will enter it.

Stephen Van Egmond
LaSalle, Ontario

Hear, hear! Having been involved in a number of programming contests here at COMPUTE! (an ST contest, a PC contest, and the most recent one, cited by Mr. Van Egmond), we've concluded that many programmers don't enter simply because they think their chances are slim. Not true. We've seen outstanding programs submitted to our magazines (only days after a contest has ended) that would have been awarded a prize in the appropriate contest. (A reminder: The "Great Arcade Machine Challenge" contest was announced in last month's issue.)

Getting Published

After reading "How to Get Published (and Make Money)" in the January issue, I thought your readers would like to hear from a published author. I have submitted many programs to COMPUTE! and have been published five times. I am a software systems analyst on a mainframe computer, and it's very satisfying knowing that programs written on my "little" 64 are being used by far more users than any mainframe program I've written.

It's true that you can make a lot of money selling programs. My computer and peripherals have paid for themselves many times over. The financial gain is nice, but when the money is spent, you still have the satisfaction of being published.

If you don't get published on your first submission, don't be discouraged. Keep trying, because the effort will bring out your best, and the rewards are well worth the effort.

Forrest Bentley
Minneapolis, MN

Wrong Month

In "How to Get Published," there is an error. On page 27, it reads " . . . in this issue, 'Crossroads II: Pandemonium'. . . ." My conclusion is that the article was slated for December and somehow ended up in January.

Doug Grabowski, Jr.
Clinton, CT

Exactly. When we assemble or "lay out" each issue (determine what goes in and where), we usually find that not everything fits. In fact, with all the different-sized articles, ads, and program listings, it's like doing a jigsaw puzzle. Sometimes, we find that one or more articles must be moved to a future issue. In the case you cited, we moved the article from December to January but failed to delete the reference to "Crossroads."

128 or 64?

I am a 128 user and, along with thousands of others, have wondered why there were so many 64 programs published, but so few for the 128.

Recently, I found a need for a particular kind of program but couldn't find one. I wrote my own with BASIC 7.0. After using the program for a while, I thought it might be of use to others and decided to submit it to a Commodore-specific magazine. After consideration, I realized that it might have wider acceptance if it were written for the 64 instead of the 128. After all, there are many more 64 users than 128 users, and the program could be used on either machine. I converted the program to BASIC 2.0, and now the program can be used by many more people.

Now I know why there are so many 64 programs and so few for the 128. It's a matter of practicality.

E. Stuart Johnson
Athens, AL

CP/M Hope

In response to Steve Aslan's letter (December 1988), I thought some light could be shed on the problem in locating sources of CP/M software.

Since CP/M has been around for some time, there is little development of new commercial software. Therefore, about the only information source is through established user groups such as CompuServe's CPMSIG. There is a treasure of public domain software available, even a library for Commodore CP/M. The CP/M Software Vendors List (CPMSRC.ARK), available from the Pittsburgh Area Computer Club (P.O. Box 6440, Pittsburgh, Pennsylvania 15212), provides an extensive list of companies and vendors who sell commercial CP/M software, and a list of companies and user groups who sell public domain software.

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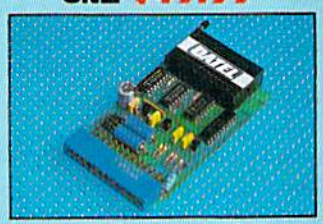

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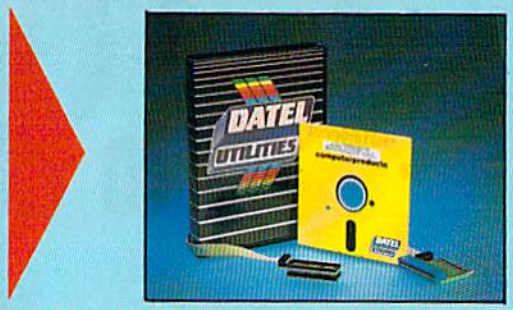

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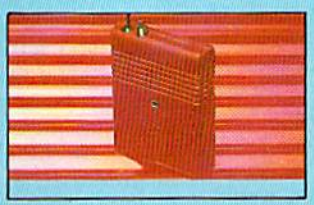

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● Freeze any program and enter a full machine code monitor ● Full Monitor Features – Disassemble, Hex, Find, Jump, Compare, Replace, Two Way Scroll, Full Disk Load/Save, Printer Support etc. In fact all usual monitor commands plus a few others. ● Because of Action Replay's on Board Ram the Frozen program can be looked at in it's ENTIRETY. – In it's Frozen state. That means Video Ram, Zero Page etc. and remember you see the code in it's Frozen state not in a Reset state as with competitors products. ● Restart the program at any point. ● No corruption ● An absolute must for the program Hacker – make changes and see your result's instantly!

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COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

Mickey McLean

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Paragon Marvels at Comics

Computer software developer and publisher Paragon Software (600 Rugh Street, Suite A, Greensburg, Pennsylvania 15601) has signed an exclusive agreement with Marvel Comics to create a series of games featuring the heroes and villains of Marvel Comics.

Paragon's first release will be an interactive comic/arcade adventure titled *Spider-Man and Captain America in Dr. Doom's Revenge*. The plot, outlined in an actual comic book included with the package, involves Dr. Doom and his plan to steal a nuclear missile and launch it toward New York City. The U.S. Government calls upon Spider-Man and Captain America to thwart Doom's plan. But Doom has enlisted the help of several Marvel Comics super villains to do battle with the super heroes.

The computer game picks up where the comic book leaves off, revealing the new comic panels on the computer monitor. You can then interact with the story through your Commodore 64, putting the future of New York in your hands.

"We're hoping that this will be the first in a long series of Marvel Comics adventure games," said Paragon Software president Mark E. Seremet. "If this initial product is well accepted, we plan to develop projects around the X-Men and The Punisher in the near future."

Paragon plans to release the Commodore 64 version of *Spider-Man and Captain America in Dr. Doom's Revenge* in June.

The software company also announced that it has signed an exclusive marketing and distribution joint venture with MicroProse. Paragon becomes a member of the Medalist Software Group, which will eventually be comprised of six noncompeting affiliate-label companies.

For 128 Only

Herne Data Systems and Free Spirit Software have recently released new products specifically designed for the Commodore 128.

Version 2.0 of *Scramb'ler-128* ($19.95) is now available from Herne Data Systems (P.O. Box 714, Station C, Toronto, Ontario, Canada M6J 3S1) for 128s operating under CP/M. A transparent, high-security disk encryption system, *Scramb'ler* protects your vital and confidential data from unauthorized access.

The program uses an encoded disk format with data encryption of personal passwords containing as many as 20 characters. The entire disk, not just the file directories, becomes encrypted.

Scramb'ler is compatible with the 1571 and 1581 disk drives but not with the 1541. It is also compatible with all standard versions of 128 CP/M and does not interfere with normal disk access. It supports both the 40- and 80-column modes of the 128.

From Free Spirit Software (P.O. Box 128, 58 Noble Street, Kutztown, Pennsylvania 19530) comes *News Maker 128* ($29.95), a desktop publishing program for the 128D and 128 with 64K video RAM upgrade. The program supports 80-column mode.

News Maker 128 can be used to create newsletters, reports, signs, and posters. It can be used in conjunction with a word processor or graphics program or as a stand-alone program.

Standard sequential files can be used with the program to pour text into user-defined columns. Graphics also can be added with the *News Maker* graphics editor or they can be imported. Other features include full-page layout, pop-down menus, font selection, and cut, paste, mirror, and flip functions.

The program requires an 80-column RGB monitor, a Commodore 1351 or M-3 Mouse, and a Commodore or compatible printer.

COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

News of Epyx Proportions

Epyx (600 Galveston Drive, P.O. Box 8020, Redwood City, California 94063) is set to acquire Infogrames, S.A., a French manufacturer of entertainment software. A general understanding has been reached regarding the purchase of all outstanding stock of Infogrames.

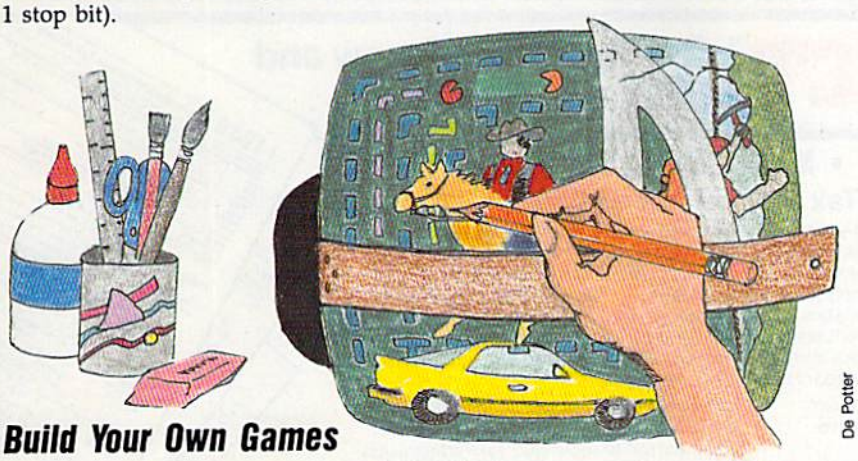
Infogrames, founded in 1983, has three operating arms—Infogrames, Ere Informatique, and Cobra Soft—that manufacture products distributed throughout Europe, Australia, and Japan and through licensees in the United States.

Infogrames plans to produce at least six new titles in 1989 for worldwide distribution under the Epyx brand name. The company will continue to publish titles under the Infogrames name.

In an unrelated story, Epyx has announced its new On-Line Service Center Bulletin Board Service. Anyone with a modem can call in for information on Epyx's products and services.

The service features day and night access, technical support, warranty and update information, an online catalog, game hints, product release-date announcements, new-product information, beta test information, market research studies, and upcoming contests.

There are no membership or per-minute charges. Customers must pay only applicable long-distance toll fees. The Epyx On-Line Service Center can be reached by calling (415) 364-0281 (300/1200 baud, 8 bits, no parity, 1 stop bit).



De Potter

Build Your Own Games

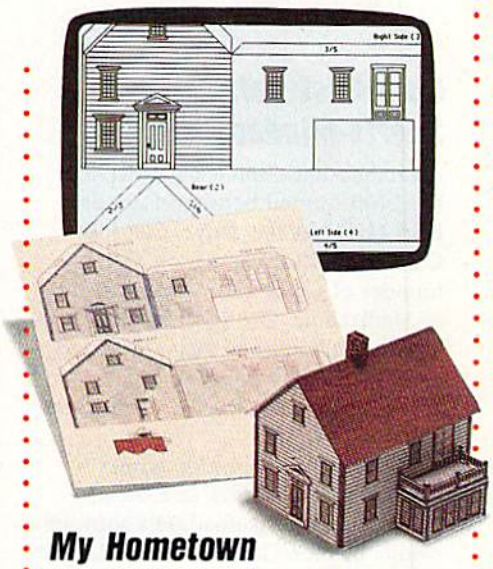
If you always thought that you could build a better computer game but you lacked programming experience, Brøderbund Software (17 Paul Drive, San Rafael, California 94903-2101) has the answer for you. With *Arcade Construction Kit* ($29.95), you can build your own arcade game without learning a programming language.

The kit provides a complete set of integrated tools for creating a variety of arcade games including maze, climbing, and shoot-'em-up styles. Games can be built from scratch, or you can customize one of seven sample games. Each game is capable of containing as many as 50 different levels of gameplay.

You can design your own characters, backgrounds, sounds, and special effects. Up to seven animated objects can appear onscreen at one time. You can also choose from four types of computer-controlled enemies.

Features include a window-based, menu-driven interface; joystick control of options; and four different editors that give you control over sound, animation, environment, and game levels.

The games can be designed for play by one to four players.



My Hometown

Have you ever wanted to build your own town? Publishing International (333 West El Camino Real, Suite 222, Sunnyvale, California 94087) can make it possible for you to recreate your favorite small town (on an even smaller scale) with *Hometown U.S.A.* ($39.95) and your Commodore 64. The program provides a series of plans for model buildings from a typical small town in America.

You can make the buildings as simple or as complex as you wish, which allows for a wide variety of building designs. The buildings can be used as Christmas decorations, as accessories for a train set, or as gift boxes.

The program is designed for use by both children and adults.

New Channels for Taito

Taito Software (267 West Esplanade, Suite 206, North Vancouver, British Columbia, Canada V7M 1A5), a subsidiary of Taito Corporation, the Japanese arcade company, has signed up nine new North American distributors to spread their arcade games throughout the U.S. and Canada.

Also, Taito has also made arrangements with several major retail chains. B. Dalton Software, Toys "R" Us, Electronics Boutique, and Babbage's have agreed to carry Taito software products.

COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

Data East Gets Sports-Minded

A product-development partnership has been formed between Data East USA (470 Needles Drive, San Jose, California 95112) and Scott Orr, founder of Gamestar, now a division of Mediagenic. Orr and Data East will launch a new line of action-oriented sports software beginning in late 1989. Data East is known for its line of arcade games.

Orr plans to develop games in the popular categories of football, baseball, and basketball. His software credits include Gamestar's *Star League Baseball, Championship Baseball, Pete Rose Pennant Fever, GFL Championship Football, GBA Championship Basketball: Two-on-Two, Star Rank Boxing I* and *II, On-Court Tennis,* and *On-Field Football.*

MicroProse Value Line

In an effort to extend the shelf life of some of their older titles, MicroProse (180 Lakefront Drive, Hunt Valley, Maryland 21030) has reduced the price of some of their popular Commodore 64 simulation games. The games are now part of the company's Value Line series, which consists of *AcroJet, Conflict in Vietnam, Crusade in Europe, Decision in the Desert, Kennedy Approach, NATO Commander, Solo Flight, Spitfire Ace,* and *Top Gunner.* The suggested retail price for each game is $19.95. **G**

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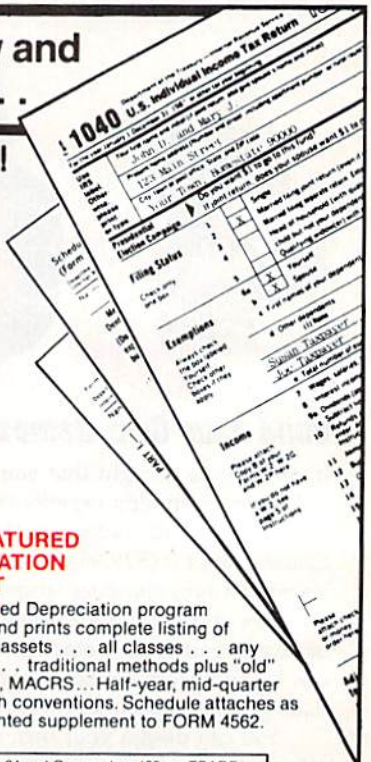

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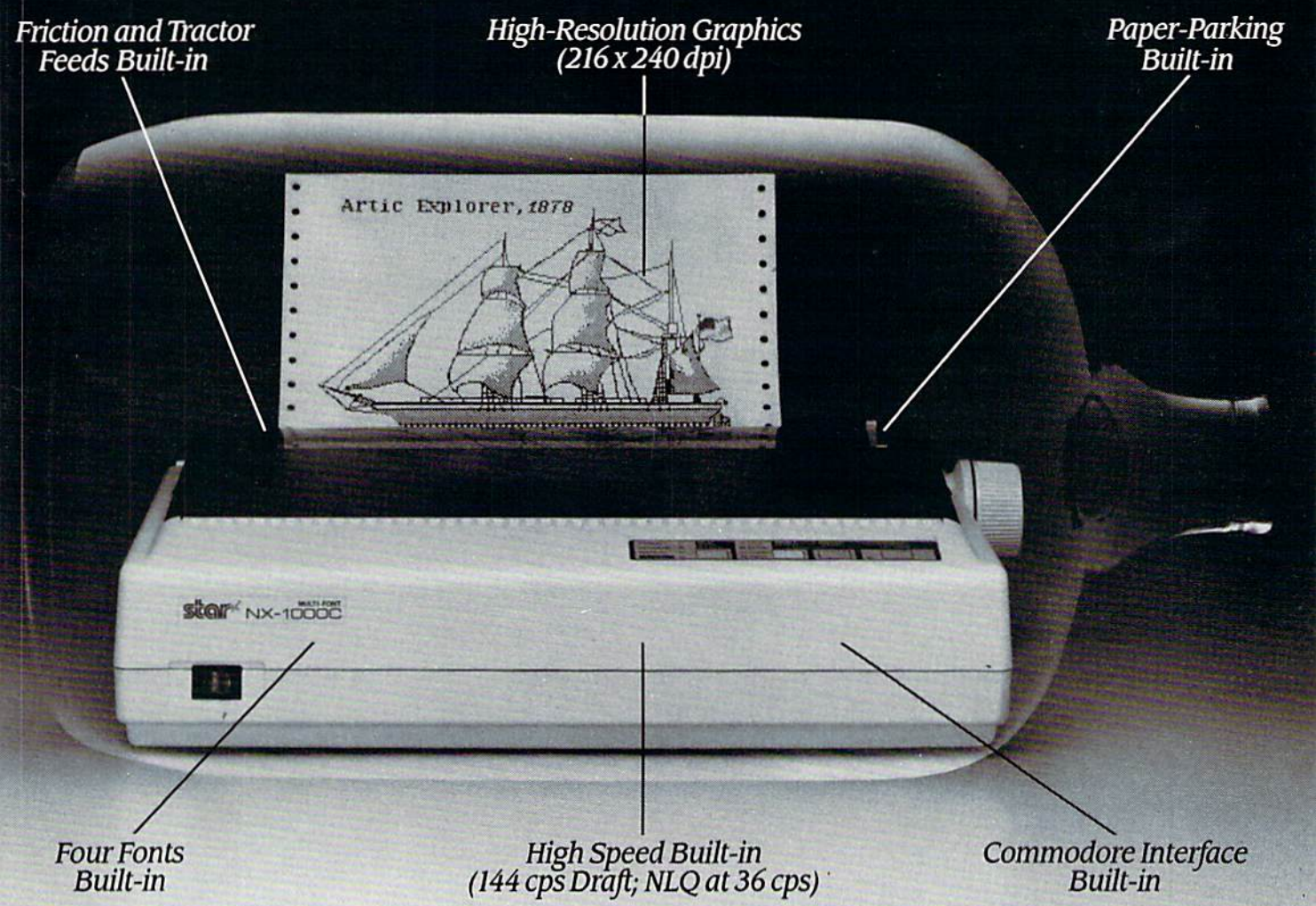
The new Star Multi-Font. How did Star get it all in there?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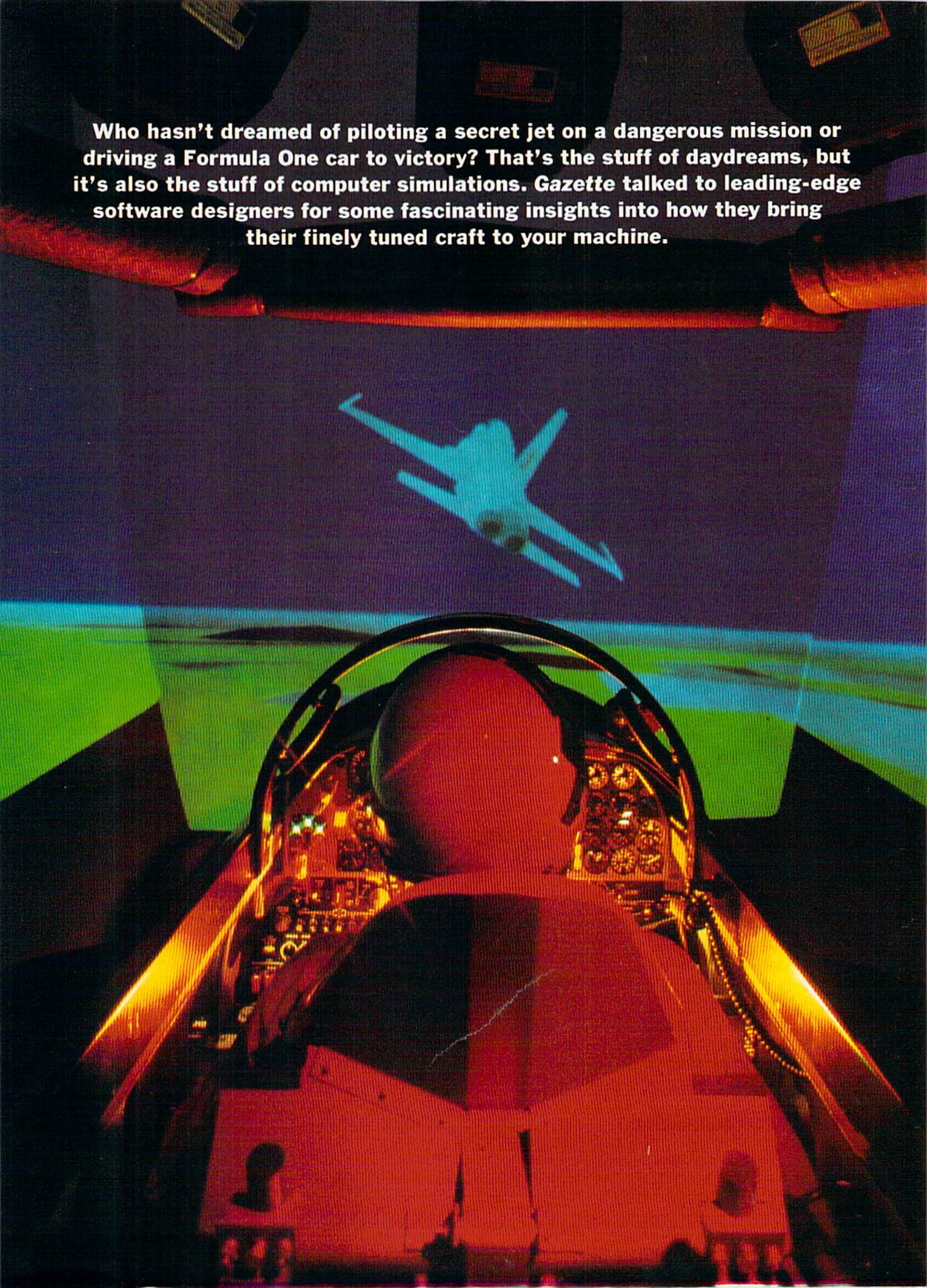
star micronics

The ImagePower™ Printers

Multi-Font printout produced by Flexidraw 5.5 graphics software by Inkwell Systems.



Who hasn't dreamed of piloting a secret jet on a dangerous mission or driving a Formula One car to victory? That's the stuff of daydreams, but it's also the stuff of computer simulations. *Gazette* talked to leading-edge software designers for some fascinating insights into how they bring their finely tuned craft to your machine.

Dream TO REALITY

SIMULATION DESIGNERS SPEAK OUT

Tom Netsel

Imagine leading thousands of troops into battle or beating Michael Jordan in a slam-dunk contest. The subject can be as serious as war or as entertaining as basketball, but in a simulation, you're not just a spectator—you're a participant. Instead of playing a game, you experience it. More than a game, a simulation draws you into a world created by its designer.

Selecting a topic is just the first step in simulation design. Your role has to be determined next. "We look for an approach that gives the player the most interesting things to do," says Sid Meier, senior vice president at MicroProse. "In an airplane simulation, that's pretty straightforward. It's not the mechanic, it's not the guy who designed the plane, it's not the guy back at headquarters telling them where to fly. It's the pilot who has the most interesting job."

Meier has plenty of experience putting players into the heart of the action and keeping them entertained. *Pirates, F-19 Stealth Fighter,* and *Red Storm Rising* are just a few of his exciting simulations.

Once Meier and his fellow staff members have decided on a topic and approach, Meier asks himself several questions: *What's really out there? What decisions does that person have to make? What technical tools are available? What problems have to be faced, and what's creating all these problems?*

Finally, Meier asks, *Is this going to be a neat game?* If a situation is too mechanical or too one-sided, it isn't much of a challenge or a game. "We try to make a situation where one person can make a difference and can tip the balance one way or the other."

D E S I G N

State-of-the-Art Aircraft

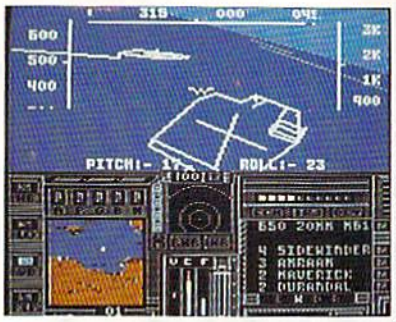
One person can make a difference—that's why MicroProse decided to simulate the the Air Force's newest flying weapon in *F-19 Stealth Fighter.* Conventional jets are usually deployed in squadrons and work together in a team effort. With its ability to slip undetected through radar, a single F-19 can penetrate enemy territory and take out a command post, photograph an important installation, or intercept a high-ranking enemy officer. "We try to pick situations where one player is the hero and has all the interesting decisions to make."

Although the F-19 is a secret aircraft, its ability to avoid being detected on radar has been widely reported. Luckily, MicroProse didn't have to duplicate the F-19's secret technology to make it fly as a simulation. "We're not interested in manifold temperatures or trying to simulate the nuts and bolts of the F-19," Meier says. "We're not interested in getting classified information because it's not really critical to getting the simulation to play accurately."

Simulations provide an opportunity to look at the human side of technology. Put a human being inside this piece of hardware and see what happens. The computer handles the mechanics and the player adds the human touch. "That's what's unique about simulation software," Meier says. "You let humans in and see what they can do with it."

Photograph by Ted Horowitz

But don't give them too much to do. Too much realism can be boring. No one wants to spend hours tuning the engine, waiting for a mission, or fueling the aircraft. And getting shot down could ruin your day or worse. A simulation offers the best parts of reality. "We're trying to provide a filtered, enhanced version of reality," Meier says, "but keep it real enough so you don't feel you're just playing some silly game."



D E S I G N

Superstar Sports Competition

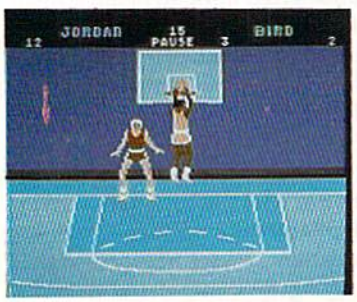
Simulations can also emulate people. That's what Don Traeger did when he produced *Jordan vs. Bird: One on One* for Electronic Arts.

Maybe you couldn't slam-dunk a basketball even if you stood on a ladder, but try this simulation and you'll step into the hightops of two of the NBA's most outstanding players: Larry Bird, of the Boston Celtics, and Michael Jordan, of the Chicago Bulls.

In three separate events, you can go one-on-one against the computer or another player, enter the Air Jordan Slam Dunk Contest, or compete in Bird's Three-Point Shootout. Every event is designed around the moves and strategies that have made Bird and Jordan tops in the NBA.

"The simulation correlation is accurate and kind of funny in a way," Traeger says. "When we decided to do the dunk contest, we thought of it as a whole new concept in flight simulators: Fly Air Jordan."

Trying to duplicate Jordan's different dunks is the heart and soul of the slam-dunk contest. If you manage to do it correctly, Jordan's tongue pops out, just as it does in real life. That's just one of the personal touches Jordan suggested during a design conference with the Electronic Arts staff.



Traeger is a huge Jordan fan. He's done extensive research into Jordan's background, taping every one of his televised games and dunk contests. After Jordan had seen the effort that Electronic Arts was putting into the game, he opened up and provided a lot of information on his playing style. Both Bird and Jordan spent time with the design staff.

Traeger divided the court into a 6 × 6 grid, with both players assigned a shooting percentage, guarded and unguarded, to each square. For dunking, finger rolls, and other moves, he divided the court into a series of concentric circles. He also established a dunk zone, a finger-roll zone, and a jump-shot zone. "Those were different for each guy," Traeger says, "because Jordan can dunk from a lot farther out."

Both players revealed their favorite shooting positions, or *sweet spots*, on the court. Bird updated the information he provided in 1984, when he collaborated on EA's *Julius Erving and Larry Bird Go One on One*.

The original version of the Erving and Bird game was pretty much a black screen with two blocky figures. The newer version, Traeger explains, is much more animated.

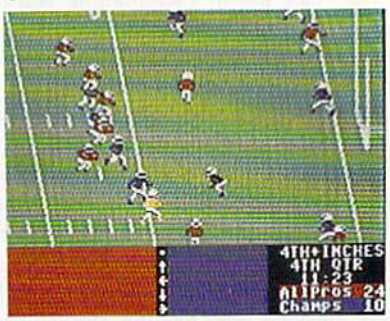
Traeger wanted larger images of Jordan and Bird on the 64 than he had in the IBM version of the game. "With the larger characters, we really have a lot of stuff moving on the screen. We tried to make things as big as we could without impacting the speed of the game. We're really maxing the 64 in terms of sprite usage. If we had one more moving sprite on the screen, it would really slow things down."

Traeger says the best is yet to come, with better technology and interactive compact discs. "I'm looking forward to 3-D modeling. Then maybe it'll be possible to see what a slam dunk looks like through Jordan's eyes."

D E S I G N

Team Sports

Seeing the action through Jordan's eyes may be a real possibility some day, but most sports fans still watch the action from stadiums or rely on the television cameras to be their eyes. Bob Whitehead, Accolade's designer of the football simulation *4th & Inches*, goes after the armchair quarterbacks and lets them call the plays.



"When I do a simulation of any sort," he says, "I try to present it from the consumer's perspective." Not many people can take a jet fighter into combat or crash-dive a submarine, but a lot of people understand sports.

"With a simulation like *4th & Inches*, consumers are used to watching the game on TV, and there are certain things they expect to see." As a result, Whitehead presents the football field from the press box rather than from the players' perspective.

One or two at-home players can call the defensive and offensive plays and watch the 22 players on the field execute the action. A screen with the statistics shows each player's performance and personal records. As you see the energy levels decline during the course of a game, you have the ability to make substitutions. You might decide to go with a experienced veteran or take a chance with a promising rookie.

"I'm action-oriented in my simulations," Whitehead says. "I try to get the user involved in the play without being distracted by all the details facing an actual player on the field." The computer version doesn't have to worry about contract negotiations, product endorsements, or commercial timeouts.

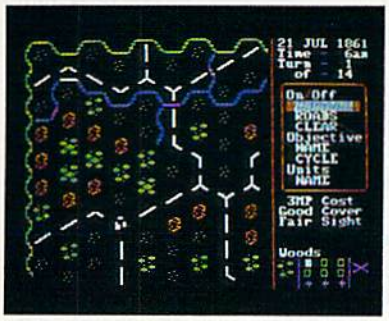
Despite all the elements a designer can add to a successful simulation, there must be compromises. "I'd like to add the isolated camera that follows the wide receiver and zoom in for a close-up as he makes the game-winning catch," Whitehead says. "But that would be terribly expensive in terms of computer memory. I'd like to add that when computers get a little bigger and a little faster."

D E S I G N

Historical War Simulation

Ian Trout, president of Strategic Studies Group, and Roger Keating, the Australian firm's chief programmer, take a different approach. In their three-volume *Decisive Battles of the American Civil War*, you compete on the battlefield instead of the playing field.

You're the commanding general. As commander, you have a sophisticated administrative structure that allows you to get your troops into battle, but your staff—like the men in the field—needs experience. As the war progresses, your staff becomes more efficient. "You start with a fairly sloppy battlefield structure like they had at the first battle of Bull Run," Trout says. "A commander's ability to affect a battlefield is quite limited—basically to about as far as he can shout."



Once the corps' structure develops, as it did for Lee and Grant, you can command armies of 70,000–80,000 men quite effectively. "A commander could have taken that many men on the field at Bull Run," Trout explains, "but it would have been a leaderless rabble."

Interested in military history for more than 20 years, Trout has an extensive library on the subject. It may seem ironic that an Australian company should turn out a series based on the American Civil War, but Trout explains: "American military history is without a doubt the best documented. The voluminous quantities of textbooks, diaries, and memoirs make research into any American war easier than anybody else's—and it's in English, which helps."

SSG looks at a simulation through the eyes of a commander, a role similar to today's business leaders, Trout says. "You not only have the enemy to fight, but you've got to be able to manipulate your own men. It's our contention that strategy games are a very useful tool to promote clear thinking. Problems you face in strategy games are very much like the ones you face in real life." ▷

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D E S I G N

High-Speed Auto Racing

Ian Trout's personal interest in military history has led to more than a dozen war games and simulations. Don Mattrick, president of Distinctive Software in Canada, enjoys driving fast cars. So it's no surprise that his company has developed several automobile simulations, including *Test Drive* and *Grand Prix Circuit*.

"A lot of us here are car enthusiasts, so we aren't exactly naïve about racing," says Mattrick, who owns a sports car and loves driving it fast on a track.

In *Grand Prix Circuit*, the player has a choice of three Formula One machines: a V12 Ferrari, a V8 Williams, and a McLaren. Each car has its own characteristics. One has a higher top speed, another has better handling, and the third is a mixture of the two.

Select a car and take it for a spin on any of the eight different Grand Prix tracks reproduced in this simulation. Qualify and you can join the circuit drivers in the race for the checkered flag. Mattrick's team researched actual tracks, determined their length and number and radius of curves, and then duplicated them on the computer. The staff watched racing videos, read books, visited different tracks, and talked with professional drivers in an effort to isolate the key elements that go into racing.

The fun part is actually getting behind the wheel and racing. Mattrick believes a simulation should be fun and that players shouldn't be overwhelmed with controls. "There are 27 different controls on the yoke of some jet fighters," Mattrick says. "A car still has more controls than you'll find on a joystick, but the components of movement and your choices are fewer."

Mattrick considers both physics and perception when designing a simulation. "You can do things that are mathematically correct," he says, "but if they don't look right on the screen, people won't feel good about what they're doing."

Try a high-speed tour of *Grand Prix Circuit*, but take a turn too fast and you'll spin off the track. Slide on a corner, kiss a wall, and you'll suffer some damage—but not enough to end the game. Hit a wall or another car too hard and you're out of the race. "The game rewards people who understand the fundamentals of racing," Mattrick says. "You have to pick your line on the course. Go into a corner, hit the apex, and accelerate through onto the straightaway."

Even if you don't join the ranks of world-class drivers, the game should still be fun. Perhaps some measure of *Grand Prix*'s appeal is reflected in the fact that the designers and programmers still play it themselves. "It's a lot of fun on the Commodore 64," Mattrick says. "We play it around here—and we've got a lot of products to choose from."

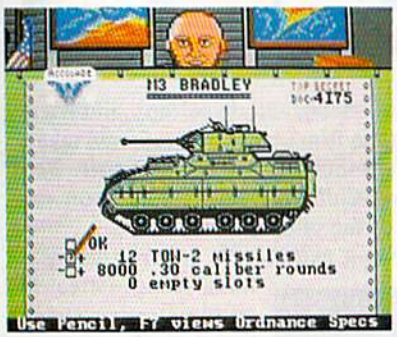
D E S I G N

Modern Tank Combat

The pace of the excitement is different in *Steel Thunder*, a tank simulation from Accolade.

Tom Loughry went to a library and dug out all the material he could find about modern tanks. Not satisfied, *Steel Thunder*'s designer visited a military base, crawled through actual tanks, photographed the interiors, and interviewed the crews.

"You get a different perspective after talking with the guys who actually use the tanks," Loughry says. "Printed material is helpful for smaller details, but for the overall approach on how to use a tank and to find out what features they don't use, you can't beat talking with the crews."



Steel Thunder lets you choose from four tanks: an M48A5 Patton, an M60A3 Main Battle, an M3 Bradley, or an M1A1 Abrams Main Battle. Loughry tried to make the screens as realistic as possible. He supplied enough details to satisfy the player who wants to learn what it takes to operate a mechanized fighting vehicle, but he also made it fun.

Not every player wants to start the engine; turn on the turret power and hydraulics; activate the gun-stabilization system, the ballistics computer, and thermal sights; and then select the right type of shell before engaging the enemy. Some people just want to shoot at other tanks.

Loughry included the realistic features for the simulation purists but also provided a simpler level for those who just want to fire up the tank and go.

"My idea was to put together a realistic simulation, but put it together so it would be extremely fun as well," Loughry says. "The gunnery, the gunsights, the periscopes—everything's simulated the way it should be. The strategy and tactics are all there, too, but I put it in a format so you could have fun with it."

Simulation designers strive to provide players with a first-person perspective in a detail-filled world, but they're forced to compromise when faced with the CPU times and memory limitations of today's home computers.

CD-ROM, faster CPU chips, and more memory will advance computer graphics even closer to movie and TV quality, heightening the impression of reality.

But technology alone can't create better simulations. Before a player can experience more realistic action, a successful simulation needs a human touch, from a creative designer with some great ideas. G

For more on Steel Thunder, *see the review on p. 18 in this issue.*

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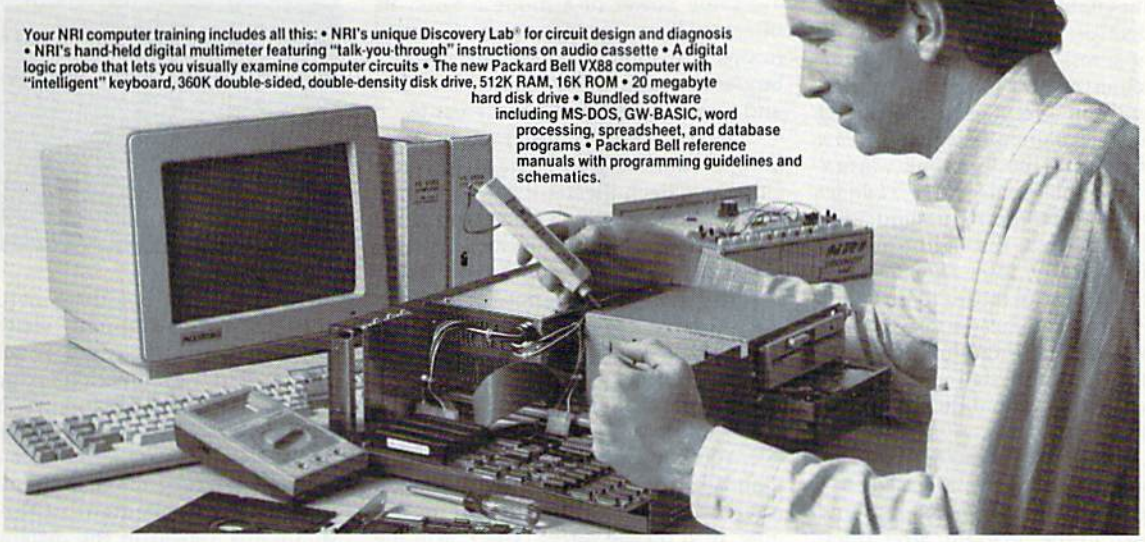

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REVIEWS

Steel Thunder

It was inevitable. First, planes. Then, cars and ships. Now it's tanks that are rumbling across the computer horizon.

Mechanized warfare has figured prominently in such recent top-selling books as *Red Storm Rising* and *Team Yankee*. Featuring modern tank warfare in global trouble spots, *Steel Thunder* would seem to be the right simulation in the right place at the right time.

Unfortunately, *Steel Thunder* faces an identity problem: It tries to be both a simulation and a game—a mix that has always vexed me. When the context for the program is presented as a game, I can never be certain that the simulation part is authentic.

This time, I did my required reading before *Steel Thunder* was released, so I was able to recognize the weapons and tactics used in the program. *Steel Thunder* does display a high degree of accuracy—though I'm sure the programmers had to make some educated guesses to simulate the classified systems.

In keeping with the movement away from disk-based copy protection, Accolade chose to use the document form of copy protection. When you boot the game, you're asked a question that can only be answered with the Sentry Password Chart. Black ink on burgundy paper makes this chart a washout on copy machines—preserving the integrity of the program at the expense of your eyes.

Following the opening question, you can start a new service record or, if you've played before, select your previous service record from the roster. This takes place in the office of General Accolade, a senior officer who looks like everyone's stereotype of an army general. This is where the program begins to feel like a game rather than a simulation.

Every combat simulator has its mission briefing. Here, still in the general's office, you're offered a choice of missions and tanks. You can choose one of four armored vehicles: M48A5 Patton, M60A3 Main Battle, M3 Bradley, or M1A1 Abrams Main Battle. You also choose the weapons necessary for the main task, as well as the troubles that will crop up along the way.

When you remember that a tank's original purpose was simply to deliver machine-gun fire against enemy riflemen, you'll be truly impressed by the awesome power of a modern tank. Its mission has also changed. Ground troops are almost incidental; today's targets include other tanks, vehicles, and gun and mortar emplacements.

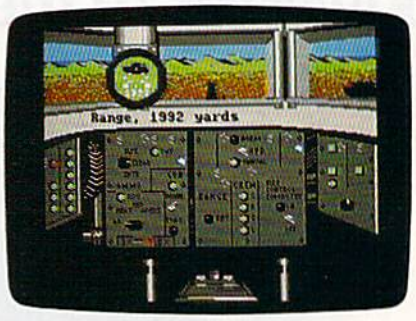
Steel Thunder offers three theaters of operation: Cuba, Syria, and West Germany. Each theater includes a practice mission (in which your tank is invulnerable), an R & R furlough, and six real missions of increasing difficulty. Before you can take on missions in Syria, you must fight in Cuba and attain the rank of second lieutenant. Once in Syria, you'll have to attain the rank of major before taking on the Russians in West Germany.

You have to use 11 keyboard commands just to fire up your tank and get it ready to roll. You have to start the engine, turn on the turret power, arm the smoke grenades, turn on the turret hydraulics, activate the gun stabilization system, turn on the ballistics computer and the thermal sight, and load a HEAT round into the cannon's breech. Between some of these moves, you need to change stations within the tank, requiring additional keystrokes. While I'm fond of realism in simulators, I do think this is a bit much, especially since the keyboard overlay gives you no clue as to the sequence of the commands.

You'll be truly impressed by the awesome power of the modern tank.

Even then, you're not finished. Next, you go to the satellite map, where you'll see your objective. Set one cursor for your first checkpoint and the other for your objective. (Since there are no terrain hazards on the map or in the game, I don't see why the route can't be a straight line.)

When you start rolling, you're in the driver's station using the joystick to control speed and direction. Switch to the gunner's station, and the joystick controls the rotation of the turret. You won't spend very much time at the commander's station.



Each station has three periscopes with slightly overlapping views. The program's apparent speed is achieved with most of the animation taking place in these three small windows, a technique used recently in other simulations.

Through the periscopes you see a solid green landscape that undulates to emulate the movement of the tank. Mountains appear in the distance, but you never seem to get any closer to them. Go to the gunner's station whenever black dots interrupt the green turf. Through the magnifying sight, you see these dots as enemy vehicles or troops.

Your joystick controls the turret rotation and gun elevation. Movements are exaggerated, as with any view through a telescope, making it difficult to line up your target quickly. (Targets never become more than silhouettes, but they do take on some semblance of the weapon or vehicle they represent.) Fly-by-wire TOW missiles require constant guidance as they speed toward the target. Use the joystick to try to keep the missile's fireball exhaust on the moving target.

When using ballistic guns, you'll do better to lead the target in the direction it's moving. Don't fire directly at the target; aim at the place it will be. You'll quickly find that it takes a direct hit—and usually more than one—to reduce a target to the pile of rubble that indicates it has been destroyed.

Your mission is accomplished when you reach your objective and destroy the enemy. At that time, or if you abort a mission, you'll return to headquarters and once again face General Accolade. He'll give you a reprimand or a commendation, depending upon how well you've done. From the general's office, you'll go to the records and see the totals of what you've destroyed.

These totals accumulate with each mission. If you've earned a promotion or a medal, you'll also see that recorded in the files.

The documentation for *Steel Thunder* is good. There's a long section on gameplay and shorter sections on tank strategy, tank specifications, and mission descriptions. The keyboard overlay can be confusing with four different tanks. For example, the C key normally turns on the miniturret hydraulics, but on the M3 Bradley, this key raises and lowers the TOW missile launcher.

Overall, *Steel Thunder* is a good simulation of modern mechanized warfare. It's a shame that the strong image suggested by the name is brought down to the level of a comic book by the character of General Accolade and the text that follows the keyboard commands. I also think the startup sequence could be shorter or more logical. The footnoted overlay is a bother, but I chalk this up to the ambitious nature of the program rather than any shortsightedness.

Once you get past these three hurdles, you'll find yourself in the middle of some very challenging missions.

—Ervin Bobo

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Instant Music

Instant Music is a creative, fun, and highly interactive program for beginners. In a sense, the less musical background you have, the more fun and creative the program can be.

Instant Music is for the amateur who wants to make music but lacks the performing skills. Author Bob Campbell thinks music represents the kind of structured environment that's just right for a computer program. As Campbell tells it, "I wanted to build a music program that would let people provide the creativity but make the computer do most of the work."

The program's design is smooth and sophisticated, with everything controlled by means of pull-down menus and a joystick or mouse. Keyboard shortcut commands are available for some operations, but not all.

At first glance, you may be overwhelmed by all the options. Stick to the manual or you may feel hopelessly lost. I spent considerable time trying to figure out how to stop the autorunning first selection. All you have to do is press the space bar, but you really have to hunt through the manual to discover that.

If you stick to the manual, you'll find a lot of help. First, there's a guided tour on how to play any of the 65 songs or 22 accompaniment patterns contained on the disk. It explains how to improvise with them (you create your own melody), vary playback tempo and volume, change instruments, and generally edit the selections.

The next section gets you into the meat and potatoes of composing and arranging. Through a series of nine studies (études), you're introduced to the many powerful tools that will help you create your own instant music. These tools relate to a number of musical basics: chords, scales, melody, and rhythm.

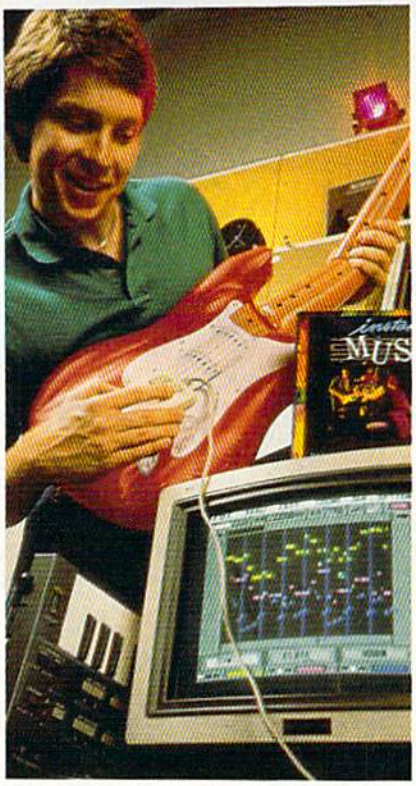
Essentially, you can improvise with any of the 64's three voices. You can do this freestyle, use one of nine preset rhythmic patterns, or select new pitches to accompany the original rhythm. When entering notes manually, you can also restrict yourself to certain rhythmic values.

In terms of pitch, you can play new notes to old rhythms, limit pitches to a scale you specify, or limit pitches to the notes of chords you determine. When you finish entering up to three musical tracks, you can edit the individual events to your heart's content.

Notation is handled by representing notes as horizontal bars whose lengths correspond to duration, with pitch represented by height. (There's no attempt at staff notation, which is a boon for beginners.) Vertical bars help you keep track of time. Any of the voices can be displayed or suppressed. A pitch *ruler* allows for precise pitch placement vertically, and a small, one-octave keyboard icon helps identify the name of the pitch under the cursor. Notes are entered by clicking the arrow-shaped cursor at a particular time point and pitch.

. . . state-of-the-art software for the creatively oriented beginner.

One of the more fascinating options in *Instant Music* deals with blank composition. Instead of loading notes, you select pitch and rhythm guides, instruments, and volume and tempo settings. This musical template permits you to compose or improvise variations on another piece. Besides being fun, this activity can be instructive, since this is basically how many arrangements are made—via imitation and variation. Many aspects of *Instant Music* have an educational value that can lead to a creative appreciation of popular music.



Another noteworthy feature is the program's unusual method of entering pitches. With its Quickdraw Patterns, you enter an entire series of notes. Select any of four patterns and a beginning and an ending point; then drag the cursor from one point to the other with the fire button depressed. This and many other options are available while the music is playing, although it sometimes slows the tempo.

The usual edit options, such as zoom, cut and paste, and copy, are available. The only option that comes up short is instrument making. The synthesizer option seems to be almost an afterthought. Even though the program provides you with a rather large number of songs, you have a choice of only 12 instruments. You can create your own sounds (within fairly strict limits), but you can't save or recall them if you make any changes.

You adjust the volume by dragging a volume bar for each instrument. This is the only way to silence the voices; the volume bar simply adjusts the sustain levels for individual instruments. You can vary the attack and release envelope parameters and waveforms with the synthesizer menu. Vibrato and pulse-width modulation are also possible; you can change both their speed and depth. Filtering is not implemented, so tonal variety is limited. Overall, *Instant Music* is designed more for jamming and making arrangements than for creating sounds.

One of *Instant Music*'s most attractive features is its MIDI output option. You are particularly fortunate if you

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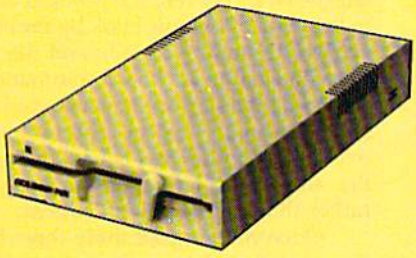

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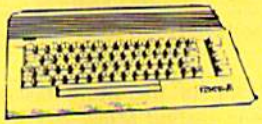

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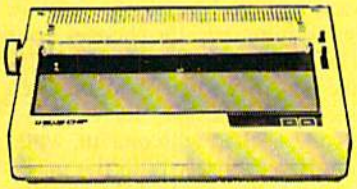

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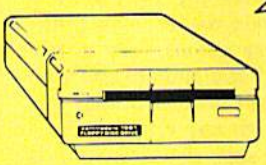

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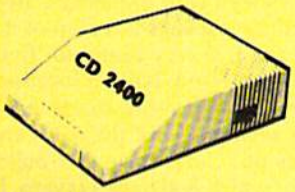

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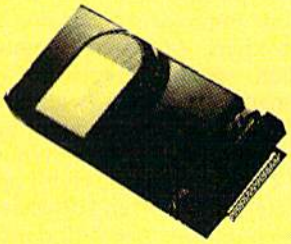

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own a Casio CZ-101 synthesizer, as the MIDI voicings for the compositions included in *Instant Music* are coded for this instrument. MIDI output allows you to play back your music on any MIDI synthesizer.

For MIDI playback, you'll also need a 64 MIDI interface (either from Dr. T or Passport) and a MIDI (five-pin DIN) cable. The keyboard's sound quality and range of available voices are superior to the 64's sound chip. For an extra treat, try mixing the 64 and keyboard synthesizer voices through an amplifier.

Instant Music's MIDI output includes a clock pulse plus start/stop for a drum machine, assuming you've programmed a percussion pattern. If you're using the Casio CZ-101, you'll need a MIDI THRU box to connect a drum machine, since the CZ-101 has no MIDI THRU connection. If you can, you should use a multitimbral synthesizer, as *Instant Music*'s output on three channels permits different instruments to play each voice.

The main problem I found with this program was a difficulty in controlling the joystick. A mouse would probably be a better choice, though I wasn't able to try one. I'm keyboard-oriented and would have preferred many more keyboard shortcuts. I feel the keyboard is simply too useful and flexible to be relegated to optional status.

Two other limitations are worth mentioning. First, songs are limited to 32 bars in length. This works well for short pop arrangements but proves too limiting for many free-form creations. Second, all the selections automatically repeat until you stop them. This is appropriate for improvising, but not for set compositions. Auto-repeat should be an option, not a requirement.

The manual contains a wealth of information, even offering a short history of rock, illustrated with selections from side 2 of the disk. The chord progressions are written out and discussed, but the instructions are not always clear. Beginners may find the short glossary of music terminology helpful, but they'll be distressed by the lack of an index.

Instant Music is state-of-the-art software for the creatively oriented beginner. By encouraging involvement in the musical process and in improvisation, *Instant Music* gets high educational marks for its approach to pop music. It's a unique and multifaceted approach to making music, based on a solid knowledge of recent musical styles.

—Art Hunkins

Instant Music
Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404
$29.95

Times of Lore

Fantasy role-playing games tend toward the complex and the time-consuming. Whatever the respective merits of *Bard's Tale, Ultima, Phantasie,* or *Wizardry,* they demand a great deal from the players. There are combat systems and magic systems to master, enormous worlds and dungeons to explore, and an increasingly numerous and difficult band of monsters to eliminate. Add some plot, a little intrigue, and a few puzzles, and the whole thing can take many hours to complete.

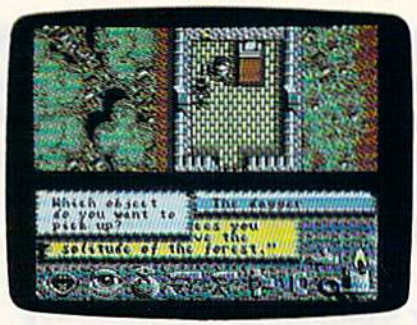
On the 64, the problem is magnified by the machine's slow disk access. *Wizardry, Faery Tale Adventure,* and *Phantasie* are hampered significantly by the number of times the game reads the disk, especially since the 1541 drive is not exactly a speed reader. This problem renders these games very nearly unplayable, and I applaud anyone who has worked—and I mean worked—his or her way through any one of them.

Applauding such determination is unnecessary in the case of Origin's *Times of Lore.* As a fantasy role-playing game, it is still time-consuming, but the time here is spent in a significantly different fashion. Only when you're booting the program is disk access necessary, and the game systems have been kept challenging yet simple. *Times of Lore* is a strong blend of role-playing and action, and as such is one of the more intriguing recent releases for the 64.

A strong blend of role-playing and action . . . one of the more intriguing recent releases for the 64.

The plot is familiar enough. An inexperienced adventurer, you are to find a way to save the Kingdom of Albareth. Basically, this means retrieving three wizardly artifacts: the Tablet of Truth, the Foretelling Stones, and the Medallion of Power. Of course, you have no idea how to go about it, and a number of subquests stand in your way. Solving your quest means traveling from place to place, conversing with a large number of people, solving a few mysteries, and wiping out a host of unthinkingly violent creatures.

But where *Times of Lore* differs from many other fantasy games is in its lack of tediousness. Take the combat system, for instance. You are not a party of adventurers, but rather one solitary adventurer, which means you don't have to command several fighters at



once. Furthermore, attacking is simply a matter of pointing your adventurer at the enemy and pushing the fire button. The game automatically chooses your best attacking weapon, and the trick is learning how many times to hit each creature. With a dagger, for example, rogues can be killed with one hit, while orcs take two or three. With the magic ax, orcs can be downed with one hit as long as you throw from far enough away. Skeletons and ghosts are more difficult, as are palace guards.

The game has a Movement mode and a Command mode. In Movement mode, you use the joystick to walk your adventurer around the kingdom, and you attack with your weapons. Pressing the space bar puts you in Command mode. Here you can use the icons at the bottom of the screen. Icons let you talk to characters; examine objects; look at your inventory; take or drop objects; use scrolls, keys, and potions; offer items to characters; pause the game; or load a saved game.

The game screen itself shows an overhead view of your immediate area. Included in the package is a map of the kingdom, and it is very useful for finding your way around. Not all locations appear on the map—the Black Asp's house, for example—but the cities and the bridges do. Cities have 4–7 buildings, one of which is always a tavern. In the tavern you buy provisions, talk to characters, get information, and purchase lodgings. When you purchase lodgings, the game is automatically saved to disk. You save only one game at a time, and, unfortunately, the save is written to the program disk.

In further support of the game's playability, there is no character-creation segment. Instead, *Times of Lore* offers three adventurers: a knight, a Valkyrie, and a barbarian. You choose one with the joystick and you're away. Nor is there a lengthy equipment and weaponry section. You simply start the quest a couple of minutes after you've booted the program.

An adventure game that runs in 64K without disk access, however, suffers some limitations. The world of *Times of Lore* is not as elaborate as that of other fantasy games, and the play options available to the player are less

plentiful. But not having to wait—at any point in the game—makes up for this deficiency quite well. The game will take less time to complete than most of the others, but for some of us, that too is a plus.

The program's most important limitation, though, is its interface. I realize it sounds nitpicky, but having to press the space bar to access Command mode is an annoyance, especially since the rest of the game can be played by leaning back in your chair with the joystick. Furthermore, it is worse than an annoyance in critical situations: When an angry guard is charging you and you're trying to press the space bar, access the Use menu, and find the Blue Scroll item (to freeze him in place), it simply takes too long. I'd prefer an optional keyboard interface where *T* means *Talk*, *U* means *Use*, and so on. As it stands, the interface is sometimes far too clumsy. At other times, it actually hinders your progress.

Times of Lore is perfect for three groups of players. First are those who enjoy fantasy role-playing games but don't have the time to work their way through *Ultima* and *Phantasie*. In the next group are players who are unfamiliar with the role-playing genre and who want to find out about it without becoming forever enmeshed in a particular adventure. Finally, *Times of Lore* is great for children, because for them, the elements of challenge are at a perfect level.

—Neil Randall

Times of Lore
Origin
136 Harvey Rd.
Building B
Londonderry, NH 03053
$39.95

M.I.S.L. Soccer

As soon as I opened the box, I began to whimper.

In the box were a 21-page game manual and an 11-page reference manual. Short on patience, I decided to take a different tack: I would just load the game and learn to play on my own. After all, soccer isn't so complex in real life; you just kick a ball toward the goal, right? Thus, I reasoned that *M.I.S.L. Soccer* couldn't be too difficult to learn.

Wrong again. *M.I.S.L. Soccer* is a simulation of professional soccer strategy and tactics both on and off the field. You can take on the role of owner and manager of a team, with the authority to trade, substitute, train, and organize the athletes. At the same time, this game lets you assume the coach's role, allowing you to make tactical decisions in the course of a game. You can also become a midfielder or goalie and go out on the field to kick a few yourself.

Working on all levels at once, you must bring your team up from the weakest in the Eastern Division of the Major Indoor Soccer League to one of the best—a daunting task, indeed.

I'm not a soccer freak, even though I live in St. Louis, which is sometimes called *Soccer City*. When I played soccer in grade school, I kicked the shins of the other players more often than I kicked the ball. As a midfielder or goalie in *M.I.S.L. Soccer*, however, I can do some pretty fancy stuff: effortless bicycle kicks, breathtaking head butts, and high and long-distance kicks.

I also get to call the shots from the sidelines. With a few quick menu selections, I can outline both offensive and defensive tactics, ranging from the safe and methodical to the risky and desperate.

Take on the role of team owner/manager and of coach, or go out on the field and join the fray.

As the coach, I also have the power to make substitutions. Let's see, we're midway through the game, and Johnson is getting tired. (I know this because the menu displays both a player's potential and his actual level of playing peformance.)

Johnson, get yer ugly face off the field! Weber, get yer cleats on!

While *M.I.S.L. Soccer* isn't a two-player game in the true sense of the word, two people can play at once. Players can't go up against each other on the field, but they can play different roles on the same team. In one particular game, I let my friend Ray play the coach since I have no head for soccer strategy. I wanted to play midfield, but there was still a goalie position open.

Ray?

Forget it, man, nobody's bouncing balls off my head!

No problem. After skimming the manual, I let the computer play goalie. Ray decided which offensive and defensive plays to run, and I kicked off, handling the action on the field.

M.I.S.L. Soccer is an interesting mix of play levels, but after a while, I became bored. The multilevel play idea is unique, and it works well. Nevertheless, I grew tired of it. The game's overall pace was too slow for me, and I became overwhelmed by all the off-field decisions.

When I sit down to play a computer soccer game, I expect a lot of action. In *M.I.S.L. Soccer*, field action is punctuated by strategy sessions—which detract from the sport's realism. I'm not

convinced that the team management and strategy decisions add much to the game's enjoyment.

Statistically oriented game enthusiasts will appreciate *M.I.S.L. Soccer* on various levels, and hard-core button pushers will enjoy the action scenes. But you'd better be in one of these two categories if you plan to really enjoy *M.I.S.L. Soccer*.

—Jesse Cohn

M.I.S.L. Soccer
Mindscape
3444 Dundee Rd.
Northbrook, IL 60062
$34.95

Barbarian

Combine one horde of villainous monsters with one large dragon and a hunk of hero. Stir in three cups of good graphics with two cups of action and a half-pound of Old English dialog. Sprinkle with a handful of deadly weapons, and then pour the contents into a 5¼-inch floppy disk. Makes thousands of servings.

Good graphics adventures habitually follow this simple recipe, and *Barbarian*, a British import from Psygnosis, succeeds with this formula. The result is a fast-paced, bone-rattling, teeth-clenching, joystick-intensive experience that appeals to a wide range of users.

. . . a fast-paced, bone-rattling, teeth-clenching experience.

Published in the U.S. by Melbourne House, *Barbarian* contains all of the proper components of a classic barbarian/dragon dual: dragon, hero, evil twin brother, and monsters. But be prepared: In this game for the 64, the crafty Brits have conceived a new joystick wrinkle.

Nothing stimulates my imagination more than a good role-playing graphics adventure, but it does produce unusual side effects. While testing this

game I found it almost impossible to speak normally. Strange medieval sentences flowed from my lips, then disappeared without a trace. But let us not tarry on this, for it will avail us naught.

You play the part of the barbarian hero, Hegor, but you don't control him directly by the joystick. Instead, you manipulate him through a series of movement icons located at the bottom of the screen. You use the joystick to direct a cursor that can be placed anywhere on the screen. Click the cursor in front of Hegor or on the *right arrow* icon to start him moving. Hegor marches on until you halt his progress with the *stop* icon.

As Hegor advances, move the cursor to the *attack* icon to vanquish any monsters that block the way, or use the *up/down* icon to make him climb or descend ladders. A total of 12 icons send Hegor climbing, running, jumping, or picking up and wielding different weapons found along the route.

There are 20 types of booby traps, animated monsters, and ghouls that wait in 48 hi-res screens in the underground world of Durgan. Some of the ever-advancing enemies cannot be defeated with your usual swift right-hook or a swipe of your trusty broadsword. These tough foes must be dispatched with bows and arrows and other battle gear scattered throughout the evil empire.

A 14-page synopsis accompanies the documentation in this well-designed package. This booklet is a mininovel that describes in gory detail the death of Hegor's warrior father, the enchanted Thoron.

Before he is devoured by a fierce dragon under the control of his evil twin, Necron, Thoron passes on to his son the birthright to destroy wicked creatures. Only Hegor can avenge the death of his father and prevent the spread of evil throughout the land. The nefarious Necron has retreated into his dark domain, deep within the earth, and he dares Hegor to enter. Once inside the dreaded land of Durgan, Hegor must both engage his uncle's monstrous horde and do battle with his horrific dragon. Only then can he confront his father's murderer.

Barbarian's action is smooth, exciting, and addictive. My pulse quickened as I advanced in the game and the action mounted. However, the lack of direct joystick control over the hero and main character, Hegor, is odd. This unique guidance system is very awkward, especially when the pace accelerates and the speed of play forces you to dart the cursor rapidly from icon to icon. One wrong click can mean certain death for Hegor.

You are granted three lives in which to complete this very difficult quest. If you fail, the percentage of your completed journey is displayed as a score, and you must restart the game from the beginning.

Dragon-slaying tales have been a favorite since before dragons became extinct. *Barbarian* uses this classic story line as an important ingredient in its recipe for adventure.

—Steve Hedrick

Barbarian
Melbourne House
711 West 17th St.
Unit 9G
Costa Mesa, CA 92627
$29.95

Stocker

Start your engine, strap yourself in, and get ready for a ride. This is no little 500-mile jaunt around a super speedway. *Stocker* is a coast-to-coast stock-car race against time. But be careful; the law is watching.

Instead of seeing the road from the driver's seat, you get a bird's-eye view of a course that starts in Florida and takes you through Alabama, Mississippi, Louisiana, Texas, New Mexico, and Arizona. The finish line—if you make it that far—is in California. Although the states are not clearly marked on the screen, the background color changes as you cross each state line.

You're always moving, except when you're on the receiving end of a speeding ticket.

Stocker is a one-player game. You're at the wheel of a two-speed car that's always moving, except when you're on the receiving end of a speeding ticket. Most of the graphics are above average, including well-designed title and opening screens.

There are two things to watch for along the route: gas stations and police. Avoid the police at all costs, but don't pass up a chance to get gas. The object of *Stocker* is to get to the finish line before you run out of fuel.

It sounds simple, but in the many times I played the game, I never made it to the finish line. It's a challenge just to stay in the race. You'll find police all along the route, but don't worry about speeding; you can easily outrun them. Just don't collide with a police car or bump one when you're passing. When that happens, the police pull you over and issue you a ticket. A trooper wearing a hat and dark glasses stands over you and asks, "Where's the fire?" If you get three tickets, the game is over.

Because fuel is critical to your success, you'll need to stop at certain gas stations along the route. If you don't, you'll soon run out of gas, and the race will be over. Each station gives you about a quarter-tank of gas, so you can't afford to miss one. You start with a full tank, which lasts just 90 seconds, regardless of your speed or driving habits. To take on fuel, simply steer into a station. You're serviced automatically, and a short tune lets you know when you're ready to roll.

You'll also need to steer around the other vehicles on the road and avoid hitting them. Collisions won't stop you, but they will slow you down and may prevent you from making it to the next gas station. Remember, fuel is the critical element in your dash across the country.

As you proceed from screen to screen, you'll see some routes identified with a question mark. These "shortcuts" may or may not be the best route to take—that's why they have question marks. Sometimes you'll find that a shortcut isn't so short; other times you'll find yourself driving against the flow of traffic. So be careful.

Once I became familiar with controlling the vehicle with the joystick, I found it very easy to manipulate the car. Press the joystick's fire button to change between low and high gear. The speed of your vehicle depends on the driving surface. When you run off the highway, the car slows down, making it difficult to get to the next service station in time.

Stocker should keep you busy trying to make it from coast to coast, though I think I would be more excited by the game if I were 13 years old. Still, while it's designed with younger players in mind, *Stocker* has enough thrills to provide the rest of us with hours of fun. With skill and determination, you may even see the checkered flag in California.

—Earl Buckelew

Stocker
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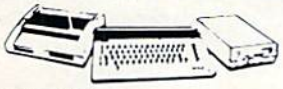

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BUYER'S GUIDE TO SPORTS GAMES AND SIMULATIONS

Mickey McLean

BASEBALL

Championship Baseball

Solid Gold Software/Distributed by Mediagenic/$14.95

In this baseball simulation, the user controls the action—hitting, pitching, catching, running the bases, and sliding. Split-screen graphics allow players to view the plate and the whole field at the same time. The game offers a four-division, 24-team league.

Computer Statis Pro Baseball

Avalon Hill/$35.00

This game uses actual major league baseball player statistics. As manager, the user chooses the lineups and makes substitutions; as a baseball player, he or she takes part in the action—hitting, pitching, fielding, and stealing bases. Major league season disks are available separately.

Full Count Baseball

Lance Haffner Games/$39.99

Full Count Baseball is a baseball strategy and simulation game in which the player manages the team. The game includes 26 teams from the most recent season and 52 past National and American League teams. Each team offers 17 batters and 12 pitchers. Players can use the teams provided or build their own teams through drafting and trading. As manager, the player can choose the lineups, batting order, bunts, sacrifices, steals, and more. The game takes into account variables such as player statistics, fielding range, speed, platooning, and the effect of the ball park. A stats compiler automatically records player and team statistics, and a box score can be printed at the end of the game. Play options include player vs. the computer manager, two-player, and autoplay. Additional team disks can be purchased for $14.99.

HardBall!

Accolade/$14.95

A baseball simulation, *HardBall!* offers a 3-D perspective of each field angle. Different screens provide the strategy selections for the managers. There are six pitches that can be thrown by left- or right-handed pitchers, and players appear in large-sized graphics.

Micro League Baseball I

Micro League Sports/$39.95

Players can manage actual big-league players in this baseball simulation. Teams can be selected from the current season or from previous seasons. Additional team disks are available, including all major league teams from the past six seasons, World Series and All-Star teams, and star players from the history of a particular franchise. The actual players play up to their potential based on their statistics and can play better if managed properly. Two players can go head-to-head or one player can compete against the computer. A box-score/stat-compiler disk can be purchased separately.

Pete Rose Pennant Fever

Gamestar/Distributed by Mediagenic/$34.95

Players can assume the roles of player, field manager, and general manager in this baseball simulation. One or two players can participate in building an expansion franchise over a span of ten seasons. Players can draft rookies, purchase free agents, and then put them on the field to perform. The action on the field—batting, fielding, pitching, and base running—is controlled by the player.

Pure-Stat Baseball

Software Simulations/Distributed by MicroProse/$39.95

This statistical-replay baseball simulation can be played with one or two players. Individual statistics determine the outcome of the game. Players can choose from every team of the 1985 season in addition to eight classic teams from the past and present. Players can be traded between teams to form a dream team. A stat keeper compiles all player statistics and calculates batting averages and ERAs. Statistics can be printed out at any time. The computer can play a game without graphics in three minutes. Players can choose from three different stadium locations. An optional stadium disk is available for $19.95. A 1987 team disk sells for $19.95 and a create-a-team disk is $14.95.

Slugger

Mastertronic/$9.99

Slugger is a computerized version of a game of baseball.

The Sporting News Baseball

Epyx/$39.95

In this simulation, players can compete against each other or against the computer, or they can set the computer to play itself. Multiple screens provide a variety of views of the action, and all the action is influenced by the actual statistics and capabilities of the ball players. Batters can hit and run, bunt, or pull the ball. Other plays include stealing the bases, pick-offs, and brushback pitches. Teams can be chosen from 26 major league clubs, or players can create their own teams from a field of over 100 famous All-Stars. The game includes color graphics and ball-park sound effects.

Steve Garvey vs. Jose Canseco in Grand Slam Baseball

Cosmi/$14.95

Grand Slam Baseball is a simulation game that includes high-resolution graphics and ball-park sound effects. A scrolling screen gives the user a television-like view of the action. Players can choose from a regular baseball game or a variation in which only grand-slam home runs can score points for their team.

Street Sports Baseball

Epyx/$19.95

This game is played on a neighborhood diamond made from trash-can lids and old tires, and the players are neighborhood pals. There are 16 players to choose from, and each has an individual level of skill in hitting, fielding, and throwing. Players also have to be able to avoid tree stumps, bushes, and puddles. The pitcher can throw four balls—fast, slow, right curve, and left curve. There's a split-screen view of the field, with one screen being a bird's-eye view. For one or two players.

The World's Greatest Baseball Game, Enhanced

Epyx/$19.95

One or two players can manage and control or just manage a baseball team, using one of the 75 teams provided or creating a team. Players include actual World Series and All-Star teams, teams from the 1984–1985 season, classic players, and current stars. Actual statistics for players are included. The game includes trading functions and trivia questions.

FOOTBALL

4th & Inches

Accolade

$29.95

4th & Inches features three screens—a scrolling football field, a statistical screen that shows the players' performance and personal records, and a play menu from which to choose offensive and defensive plays. The game incorporates 22 players, the football, and the ball's shadow. The view of the field is from the press box, and action follows the player with the ball. The players' energy levels decline as the game progresses. For one or two players. The *4th & Inches Team Construction Disk* allows players to create their own teams. It retails for $14.95.

GFL Championship Football

Gamestar/Distributed by Mediagenic/$34.95

This football simulation is played using an on-the-field perspective. The action takes place on the field, where the user is actually running plays and taking hits.

John Elway's Quarterback

Melbourne House/Mastertronic/$29.99

Based on the arcade game of the same name, *Quarterback* requires strategy and playing ability. Players must call the plays and then carry out the action on the field. Features include a choice of all 28 NFL teams, arcade-style graphics and animation, and digitized sound effects.

Pure-Stat Football

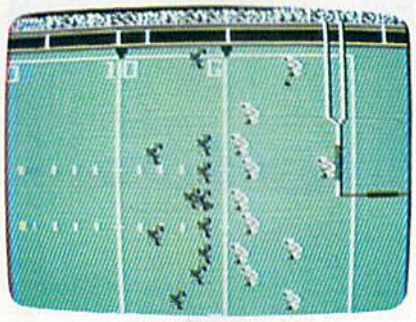
Software Simulations/Distributed by MicroProse/$39.95

One or two players can participate in this football simulation game. The performance of the players is determined by speed, power, and catching ability. Users can determine their own playing parameters and call all the shots from the sidelines. Players control the quarterback and receivers on offense and one key player on defense. A 1987 team disk sells for $19.95, while a create-a-team disk is $14.95.

Street Sports Football

Epyx/$19.95

Players choose from nine neighborhood guys to make up teams and play on a city street or a construction site. Obstacles include oil slicks, trash-can lids, puddles, and parked cars. Plays can be selected from a computerized playbook, or players can design a street playbook of their own. There are advanced and beginner levels of competition.



Super Sunday

Avalon Hill/$19.99

With this statistics-based game, each player enters the offensive and defensive plays for his or her team and then watches as the game is played. There are 20 Super Bowl teams to choose from, and season disks for the champions are available separately. The game also contains solitaire and autoplay options. A *General Manager's Disk* is available for $30.00, and a *Champion Disk* and *1984–1987 Season Disks* are $20.00 each.

3 in 1 College & Pro Football

Lance Haffner Games/$39.99

As the coach in this pro-football strategy game, the player can choose from 14 offensive and 6 defensive plays, call timeouts, use the two-minute drill, and compare scouting reports. The game can automatically compute individual and team statistics and provide a scoring summary at the end of the game. The stats compiler can record statistics for every team and player plus past schedule results for each team. The game includes 176 college teams, 28 NFL teams, and 14 USFL teams. Additional team disks can be purchased for $14.99.

The World's Greatest Football Game

Epyx/$19.95

This football-strategy game lets one or two players coach as well as play a game of football. Players can use the playbook or design their own offensive and defensive plays and then take part in the execution of those plays. Joystick required.

BASKETBALL

Basketball: The Pro Game

Lance Haffner Games/$39.99

In this simulation, the player can coach an NBA or ABA basketball team, choosing the starting lineups, substitutions, shot selection, passing, and offensive and defensive styles of play. Statistics on individuals and whole teams for an 82-game season can be maintained with the stats compiler, and a summary of each game can be printed when the game is finished. The program includes 23 current NBA teams plus more than 100 great teams of the past. Additional team disks are available for $14.99.

Courtside College Basketball

Lance Haffner Games/$39.99

The player can coach Division I college basketball teams as they compete for the championship with this strategy game. Options include lineup, substitutions, shot selection, passing, defensive and offensive styles, and the 45-second clock. Statistics for each player include rebounding, passing, defense, shooting ability, and overall-contribution factor. The stats compiler maintains statistics for individual players and the whole team, and a summary can be printed to screen or a printer at the end of each game. Players can play against a friend or the computer, or they can watch the computer play itself. The game includes 286 teams from the most recent season plus 70 all-time-great college teams. Additional team disks can be purchased for $14.99.

Dr. J and Larry Bird Go One-on-One

Electronic Arts/$14.95

Players can become either Julius Erving or Larry Bird in this one-on-one action game.

Fast Break

Accolade/$29.95

This three-on-three basketball game features full-court action from a television perspective. Players can choose offensive and defensive plays and substitute players. The game is played under professional rules with three-pointers and slam dunks. For one or two players.

GBA Championship Basketball Two-on-Two

Solid Gold Software/Distributed by Mediagenic/$14.95

Each player can control two men in basketball competition—two against two, one on one, or one or two players against the computer. The teams play in 24-team leagues, and the players are based on real pro-basketball players. There are several practice games, including practice shooting, horse, one on one, and around the world. Crowd noises provide background sound effects, and a sample sports page is updated with the results of each game.

Jordan vs. Bird: One on One

Electronic Arts/$29.95

Superstars Larry Bird and Michael Jordan battle on the court in three special events. Players can see who's the best in the One on One battle, the Slam Dunk Competition, and the Three-Point Shootout.

NBA

Avalon Hill/$39.95

Players can control basketball players of the past and present in this statistical basketball computer game. Users can pick the starting lineups and send in substitutes. The program includes 20 great teams from the past and a stat keeper that keeps track of how well each team is doing. The game features three playing modes: head to head, solitaire, and autoplay. The autoplay mode allows the same teams to play several games in a row. Additional season disks are available for $20.00 each.

Pure-Stat College Basketball

Software Simulations/Distributed by MicroProse/$39.95

This animated five-on-five basketball simulation game is based on statistics. One or two players can compete or the computer can play itself. Coaching strategy and player statistics determine the outcome of each game. Players can choose from 20 all-time-great college teams. Users can also create their own team by entering statistics. Team statistics can be reviewed or printed at any time. Optional team disks are available. Separate tournament disks sell for $19.95 and a create-a-team disk retails for $14.95.

Slam Dunk

Mastertronic/$9.99

This simulation of two-on-two basketball features slam dunks, lay-ups, and alley-oops. The program also keeps track of player statistics.

Street Sports Basketball

Epyx/$19.95

One or two players compete in this neighborhood-style basketball game. The court is set up in a schoolyard, alleyways, or a park, and three players for each team are chosen from ten neighborhood dribblers. Much of the strategy involves how well each player has put together his or her team and how well the hoop shooters can avoid local obstacles such as oil slicks and fences.

SOCCER

M.I.S.L. Soccer

Mindscape/$34.95

Players can assume the roles of player, coach, and general manager in this simulation game based on the Major Indoor Soccer League. Coaches can choose lineups and make substitutions. The General Manager can attempt to build a successful MISL franchise by drafting and trading players. The onscreen players can attempt headers and assorted kicks. For one or two players.

Street Sports Soccer

Epyx/$19.95

Another in the Epyx line of street-sports games, *Street Sports Soccer* enables players to take part in a fast, street-style soccer game. Players must first choose a field either in a park or on a city street and then recruit a three-member team from the neighborhood kids. Each character has his or her own personality and skills for heading the ball, executing shots, and controlling passes. There are few rules and no uniforms or sportsmanlike conduct. Teams can play each other or play the computer with a time or points limit.

Superstar Soccer

Mindscape/$34.95

In *Superstar Soccer,* the player can perform as soccer player, coach, or owner and manager. As center or goalie, the player can run, shoot, pass, and even get injured. As the coach, the player calls the plays and sends the team to training camp. The owner/manager trades and recruits team members. One or two players can compete against the computer or each other.

ICE HOCKEY

Hat Trick

Capcom/$29.95

Players compete head-to-head in this ice-hockey game. Each player controls a goalie and a player on the ice. Based on the Bally arcade game.

International Hockey

Artworx/$19.95

The fast action of hockey is recreated in this game for players ages 8 and older. *International Hockey* includes body checks, fighting penalties, puck passing, graphics, and sound effects such as crowd noise, organ music, and digitized speech. One or two players can compete on three skill levels.

Superstar Ice Hockey

Mindscape/$34.95

One or two players can face off against each other or the computer. In this multi-level game, the player can be the owner and general manager, trading and recruiting players or sending the team to a training camp. As head coach, the player can set and change the lines and plan the strategies. Or, the player can act as goalie or center and play on the team. This simulation allows for two-on-two, four-on-four, or six-on-six games. A team can compete against 19 other teams in four divisions for up to nine seasons.

VOLLEYBALL

Beach Blanket Volleyball

Artworx/$14.95

One or two players can practice three-on-a-team beach volleyball with this game. The game includes nine levels of difficulty and a self-running demonstration. For ages 14 and up.

GOLF

California Pro Golf

Mastertronic/$9.99

California Pro Golf features an 18-hole golf course complete with hazards. Players have touch-sensitive control of the shots and a choice of clubs.

Hole in One Golf

Artworx/$14.95

Players can tee off on the North Course and play a round of golf at the Fairport Country Club, or use the editor to design their own golf course. This golf game includes backspin, topspin, hook, slice, and power of the swing, as well as water traps, rough, and bunkers. The zoom feature magnifies the putting area on the green. The disk contains the master program and six additional courses. For players ages 14 to adult.

Jack Nicklaus' Greatest 18 Holes of Major Championship Golf

Accolade/$29.95

Jack Nicklaus' Greatest 18 Holes of Major Championship Golf is based on the recently released videotape from the ABC Sports Video library. This golf simulation features Nicklaus's favorite 18 holes of major championship golf along with two additional Nicklaus-designed courses. Players can compete against up to three other human opponents, a computerized Jack Nicklaus, or a variety of computerized men and women. Other features include a choice of Skins scoring or stroke play; pro, men's, or ladies' tees; wind intensity and direction; and uphill or downhill lies.

Leader Board

Access/$19.95

One to four players can simulate an actual game of golf on one of these 18-hole courses. Players choose their clubs, distance, and type of shot. There are three levels of difficulty, and the computer calculates the handicaps and scores. Tournament Disk #1 and Executive Tournament Disk, which are additional course disks, are included with the package.

Tournament Golf

Avalon Hill/$30.00

One to four players can choose to challenge one of two 18-hole championship courses. Players can also practice on the driving range or the putting green.

World Class Leaderboard

Access/$14.95

Three famous 18-hole golf courses are reproduced in this golf game, including distance, traps, trees, rough, and water hazards. Players can tee off at St. Andrews, Doral, and Cypress Creek. A fourth course, the Gauntlet Country Club, was designed for this program. The program also offers a printout of the scorecard, an editor to rearrange the holes, a top view of each hole, a practice putting green, and driving ranges. Additional courses are available. Volume I contains Harbour Town, Sunningdale, Dorado Beach, and a course designed by Access, Pine Ridge. Volume II includes Pebble Beach, Muirfield, Colonial Country Club, and the Access course Glenmoor Country Club. Additional course disks are included with the package.

World Tour Golf

Electronic Arts/$14.95

Players can choose from 12 of the world's greatest golf courses or become an architect and design their own course. Courses include St. Andrews, Pebble Beach, Augusta National, and Shinnecock Hills. The program also includes a championship course made up of the world's most difficult holes. One to four players can participate, with a choice of either match or medal play. Players can also compete against up to three computer golfers and set characteristics for each. Split-screen animated graphics give both an overhead view and a golfer's-eye view of the hole. In addition to normal hazards, players will encounter random weather conditions each time they play. Players can also practice on the driving range and putting green.

TENNIS

Serve and Volley

Accolade/$29.95

Serve and Volley requires players to use correct ball placement, timing, and stroke selection. Users can choose from three difficulty levels and three court surfaces. Game activity can be viewed from a full-court perspective with action windows. Players must first select a serve type and then hit volleys, forehands, backhands, smashes, and lobs. The game offers match or tournament play against the computer or for two players against each other. Each tournament or match can be saved and resumed.

BOWLING

10th Frame

Access/$39.95

Up to eight players can participate in this bowling game. There are several levels of play, including league competition. Scoring is automatic.

BILLIARDS

Rack 'Em

Accolade/$29.95

Players can compete in snooker, bumper pool, straight pool, eight ball, and nine ball. Variables such as the object ball and pocket, aim, English, and power affect gameplay. A restore-shot feature allows the last shot to be retaken. Players can attempt trick shots and save the best ten. *Rack 'Em* includes a generic game that allows players to set their own rules. A bumper-pool construction set allows players to create their own bumper-pool tables. For one or two players.

BOXING

Fight Night

Accolade/$14.95

This boxing game requires strategy as well as skill. It includes a boxer construction set.

Sierra Championship Boxing

Sierra On-Line/$14.95

Some of boxing's most famous bouts can be recreated with this game, or players can create new matches using a list of 50 former and current boxers. As trainer, the player plans a strategy and determines height, weight, stamina, and best punch for the contender. In the arcade mode, players can fight each other or the computer. Two manuals explain the art and strategy of boxing and the history of the sport.

Star Rank Boxing II

Gamestar/Distributed by Mediagenic/$29.95

Two players can play each other or one player can challenge the computer in a battle for the boxing title. Each boxer must defeat four challengers on the way to the championship; challengers become more skillful as the match progresses. In the exhibition bouts, boxers can fight in welterweight, middleweight, or heavyweight classes, with up to five boxers in any one class. Players must create a training regimen for their boxers and improve their skills in blocking and ducking punches, throwing crosses, jabbing, uppercutting, and taking body shots. A tale of the tape containing the boxer's statistics and record appears before each fight.

T.K.O.
Accolade/$29.95

This arcade-style, split-screen boxing game features a first-person perspective, allowing players to get a feeling of being in the ring. Players can use both offensive and defensive maneuvers, including dodging and ducking punches. When hit, each boxer's face shows the damage sustained, including black eyes, fat lips, swollen cheeks, a bruised forehead, and a cut jaw. For one or two players.

WRESTLING

Bop'n Wrestle
Mindscape/$14.95

Gorgeous Greg fights for the professional wrestling championship belt against ten other contenders with moves like the airplane spin, back breaker, drop kick, full Nelson, pile driver, stump, and flying body press. Two players can control opposing contenders, or one player can challenge the computer. The action takes place in a 3-D ring and requires either joystick or keyboard input.

Micro League Wrestling
Micro League Sports/$29.95

This official product of the World Wrestling Federation features stars of the WWF digitized on the screen. Players select wrestling moves from a menu and the computer determines the result. Two additional match disks are available for $19.95 each.

Tag Team Wrestling
Data East/$19.95

The player and a partner can use body slams, drop kicks, back breakers, and flying head butts to defeat opponents and win the championship belt. Wrestlers must be pinned for a count of 3 to win, or they can be thrown out of the ring.

Take Down
Gamestar/Distributed by Mediagenic/$32.95

Players participate in the Gamestar Wrestling Federation, where they can choose from eight wrestlers, each with different moves. Wrestlers can perform pile drivers, body slams, airplane spins, atomic drops, and suplexes. The object of the game is for the team to win the GWF Tag Team Championship.

RACING

Cosmi's Motor Racing Trilogy
Cosmi/$19.95

This package has three games: *Richard Petty's Talladega,* a stock car–racing simulation; *Shirley Muldowney's Top Fuel Challenge,* an NHRA drag-racing game; and *Grand Prix Motor Mania,* which features road racing with ten different skill levels. Each game is available separately for $9.99.

Grand Prix Circuit
Accolade/$29.95

Grand Prix Circuit simulates the Formula One season. Players can choose to race for the McLaren, Ferrari, or Williams team on the Grand Prix courses of Monaco, Germany, or Japan. The ultimate goal is to win the World Driving Championship against a diverse group of racing rivals.

The Great American Cross-Country Road Race
Solid Gold Software/Distributed by Mediagenic/$14.95

This 3000-mile car race takes place across the U.S. The player chooses which route to take through which cities in order to finish in the top ten. Variables include weather, fuel, road conditions, and the competition.

Top Fuel Eliminator
Gamestar/Distributed by Mediagenic/$29.95

Players can join the auto-racing circuit and compete in a nine-event season, from qualifying rounds to winning the circuit. The driver races against the computer opponent on a randomly generated race course. There are eight performance areas in which to judge the races. Split-screen graphics allow the player to view the course from overhead and in the cockpit.

OLYMPIC-STYLE COMPETITION

California Games
Epyx/$39.95

Up to eight players can take part in this survey of California-style recreation. Games include surfing, throwing flying discs, skateboarding, roller skating, and riding BMX bicycles.

The Games: Summer Edition
Epyx/$39.95

The Summer Edition is the official computer game of the 1988 U.S. Olympic Team. Players can participate in events such as the hurdles, pole vault, uneven parallel bars, rings, springboard diving, and velodrome sprint cycling. The action can be viewed from first-person perspective or camera-angle points of view. Players can attend opening, closing, and awards ceremonies.

The Games: Winter Edition
Epyx/$39.95

Players can compete in seven Winter Olympic trials—oval-track speed skating, downhill skiing, slalom, luge, ski jump, figure skating, and cross-country skiing. The screen can display camera-angle points of view to resemble actual television coverage, and in the downhill-skiing competition, players can position the cameras to monitor their performance. Up to eight players can take part in the events, based on the Olympic competition held in Calgary, Alberta, Canada, in 1988. The game was designed with assistance from the U.S. Olympic Team affiliates and videotapes from the U.S. Olympic Committee.

Gold Medal Games
Cosmi/$9.95

Players compete in Olympic-style events including weightlifting, swimming, and archery.

Highland Games
Artworx/$14.95

Players ages 9 and up can test their skills at traditional Scottish competition with *Highland Games.* There are six events—hammer throw, discus, long jump, caber toss, weight toss, and tug-of-war—with bagpipe sound effects in the background. For one or two players.

International Team Sports
Mindscape/$29.95

Players choose an athlete and a country to represent them in athletic events including volleyball, soccer, water polo, swimming, and track.

Summer Games
Epyx/$19.95

Up to eight players can enter their athletes in Summer Olympic competition including swimming, diving, track, skeet shooting, pole vaulting, and gymnastics. Athletes compete against each other, vying for the gold medal.

Summer Games II
Epyx/$19.95

Up to eight players can compete against the computer or each other in this representation of the Summer Olympic games. Events include rowing, triple jump, javelin throwing, high jumping, fencing, cycling, kayaking, and equestrian events. There are also opening ceremonies, national anthems, and medals.

Winter Challenge
Thunder Mountain/Distributed by Mindscape/$14.95

One to six players can compete in five winter events including ski jump, downhill skiing, bobsled, giant slalom, and biathlon.

Winter Games
Epyx/$19.95

This game lets players take part in seven of the Winter Olympic games, including figure skating, bobsledding, and the biathlon. The game includes the opening ceremonies and national anthems. For one to eight players.

World Games
Epyx/$19.95

Players take the part of athletes representing 18 countries as they compete in some not-so-common athletic events. There's cliff diving in Mexico, sumo wrestling in Japan, weightlifting in Russia, bull riding, barrel jumping, log rolling, the caber toss, and the giant slalom. A history guide and travelogue are included, as well as seven options of practice and competition. For one to eight players.

COMBINATION GAMES

Clubhouse Sports
Mindscape/$29.95

Players can choose to compete in darts, pinball, billiards, shooting gallery, Skee-Ball, or foosball.

Indoor Sports
Mindscape/$29.95

This sports package contains four different indoor games to play—air hockey, table tennis, bowling, and darts. Players can compete against each other or the computer. The program includes 3-D graphics and animation.

Prism Sports Pack
Thunder Mountain/Distributed by Mindscape/$14.95

Six different sports games are included on one disk: *Turbo 64, Derby Day, Pilot 64, Handicap Golf, World Cup,* and *Test Match.*

Star League Baseball *and* On-Field Football
Solid Gold Software/Distributed by Mediagenic/$14.95

Two games have been combined in this one package. *Star League Baseball* recreates the nine-inning game with animation, sound effects, and true-to-the-game action. In *On-Field Football,* players can call the plays for both offense and defense during four quarters of action.

Star Rank Boxing *and* On-Court Tennis
Solid Gold Software/Distributed by Mediagenic/$14.95

In *Star Rank Boxing,* players must battle against challengers to work their way up to the title bout. Players of *On-Court Tennis* can challenge a friend or a computer-supplied professional tennis player based on an actual athlete. Lobs, swings, and bounces occur just as they would in a real game. Players get to choose the court surface as they play in a world-class match.

MISCELLANEOUS

Daily Double Horse Racing
Artworx/$19.95

This horse-racing game simulates a day at the races. A 16-page racing form is included with the package that features results on 180 different horses from 400 prerun races. Players can choose from 12 jockeys and four turf conditions. The program allows players to place bets on the horses before it runs the race.

Equestrian Showjumper
Artworx/$14.95

Up to six players can compete in this steeplechase game. Each player controls his or her horse's walk, canter, gallop, turns, jumps, and other movements. There are 12 steeplechase courses with walls, fences, and gates to jump, or players can use the editor to design their own course. A master scoreboard updates scores and faults. For ages 14 and older.

Final Assault
Epyx/$39.95

Thrill seekers can practice climbing some of the world's most treacherous peaks with this mountain-climbing game. Mountain climber Eric Escoffier provided design assistance for the rock faces, glaciers, crevasses, and chasms found along the trails. Players must choose which supplies to backpack from over 50 items. Onscreen variables include temperature, time, altitude, and physical state of the climber. There is a training course before the climb, and a safety guide is provided.

Ten Speed
Mastertronic/$9.99

Players compete in world-class cycling events in *Ten Speed.*

Water Polo
Mastertronic/$9.99

This game lets players take part in the fast action of water polo, a mix between soccer and basketball played in the water. It offers a variety of skill levels and tournament options for one or two players. The flippy disk contains versions for the Commodore 64 and the IBM PC and compatibles.

Sports Games Publishers

For more information about the sports games listed here, contact the publishers listed below:

Access
2561 S 1560 W
Woods Cross, UT 84087

Accolade
550 S. Winchester Blvd.
San Jose, CA 95128

Artworx
1844 Penfield Rd.
Penfield, NY 14526

The Avalon Hill Game Company
4517 Harford Rd.
Baltimore, MD 21214

Capcom U.S.A.
1283-C Mountain View/Alviso Rd.
Sunnyvale, CA 94089

Cosmi
415 N. Figueroa St.
Wilmington, CA 90744

Data East
470 Needles Dr.
San Jose, CA 95112

Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404

Epyx
P.O. Box 8020
600 Galveston Rd.
Redwood City, CA 94063

Gamestar
Distributed by Mediagenic
3885 Bohannon Dr.
Menlo Park, CA 94025

Lance Haffner Games
P.O. Box 100594
Nashville, TN 37210

Mastertronic
711 W. 17th St.
Unit 9G
Costa Mesa, CA 92627

Melbourne House
Distributed by Mastertronic
711 W. 17th St.
Unit 9G
Costa Mesa, CA 92627

Micro League Sports
2201 Drummond Plaza
Newark, DE 19711-5711

MicroProse
180 Lakefront Dr.
Hunt Valley, MD 21030

Mindscape
3444 Dundee Rd.
Northbrook, IL 60062

Sierra On-Line
P.O. Box 495
Coarsegold, CA 93614

Software Simulations
Distributed by MicroProse
180 Lakefront Dr.
Hunt Valley, MD 21030

Solid Gold Software
Distributed by Mediagenic
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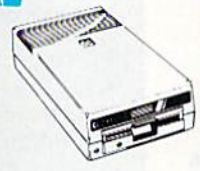

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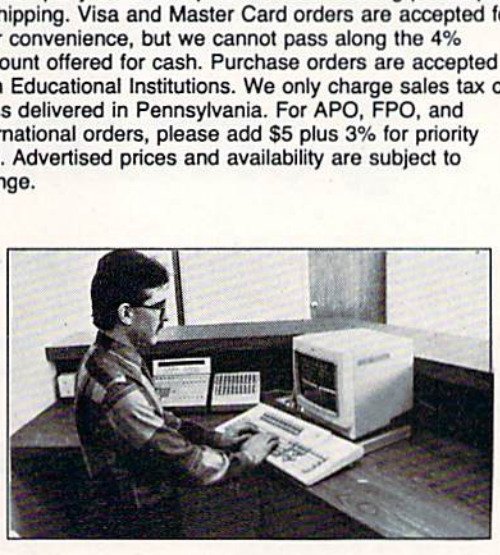

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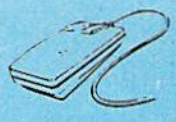

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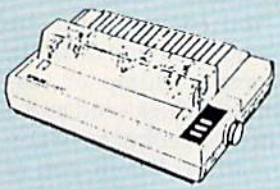

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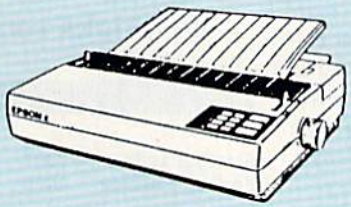

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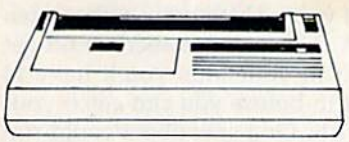

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With a print speed of 180 cps (draft) and 30 cps (NLQ), the high performance Okidata 180 saves you time. Okidata has made operating the 180 easy with one touch control, a feature usually offered only on higher priced printers. This is a printer built for the long run. With great features, compatibility and speed, the Okidata 180 means real value for your printing needs.

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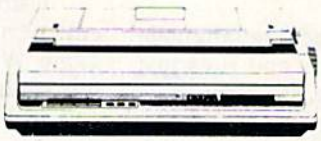

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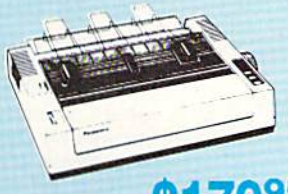
The 1180 by Panasonic offers you more than what you might expect in a low cost printer. With multiple paper paths, versatile paper handling, and front panel programmability through the EZ Set Operator panel, the 1180 is an excellent value. The 1180 also features 2 excellent print qualities: Near Letter Quality and Draft, with speeds up to 192 cps in Draft and 38 cps in Near Letter Quality plus crisp, clear graphics.

KX-P 1091i Model II

For speed and flexibility in your office or home, Panasonic combines 192 cps draft with 38 cps NLQ for a wide variety of printing needs. A 2-year warranty from Panasonic assures quality support.



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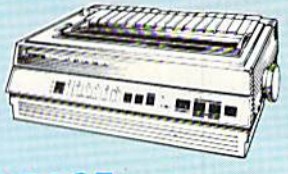
KX-P 1124

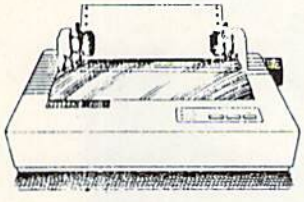
For excellent print quality in a high speed printer, choose the KX-P 1124. Its 24 pin print head produces draft text at a quick 192 cps (draft) or letter quality text at 63 cps. In addition, the KX-P 1124 provides such standard features as selectable push/pull tractor, 5 resident print fonts, parallel centronics interface and a standard 6K buffer. Panasonic's KX-P 1124 ensures that your printing will be fast and professional.



$319.95

CITIZEN

Citizen 120D



If you are seeking world renowned printer performance for your home, look no further than the 120D. Your data processing needs are handled quickly at a print speed of 120 cps (draft) or 25 cps (NLQ). The 120D features 9 pin dot matrix print quality, standard parallel centronics interface and a 4K text buffer.

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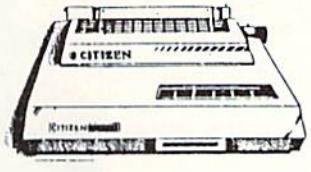
Citizen 180 D



You can always rely on the Citizen 180 D. From its price/performance value, to a print speed of 180 cps (draft) or 29 cps (NLQ) the Citizen 180 D is an excellent printer for the home or small business.

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The Anglers

Tai Bush

Ever try competitive fishing on your 64? In this two-player arcade-style game, everyone has fun but the fish. Joysticks required.

Starting address: 0801
Ending address: 14F0

"Here fishy, fishy. Nice fishy." You'll do anything to catch a fish.

Fishing used to be relaxing. It used to be a way for you to put aside the stresses of the rat race. Now, as you enter into the finals of the First Annual Great Lakes Fish Off, you realize that fishing has become an obsession. Well, you'll pick up a new hobby later. But now you must concentrate. You eye your competitor smugly and say, "May the best angler win."

"The Anglers" is a two-player game for the 64. Using joysticks, you and a friend cast lines into the water, each trying to catch the most fish. Be careful—if you get your line caught in seaweed, you'll lose time. And if your line gets snagged on a speedboat, well, prepare to get wet.

Getting Started

The Anglers is a machine language program, but it loads and runs just like a BASIC program. Type it in using "MLX," the machine language entry program found elsewhere in this issue. When MLX prompts you, respond with the values given below.

Carefully type in the data for The Anglers. Be sure to save a copy of the program to tape or disk before exiting MLX.

To play The Anglers, load the program as if it were written in BASIC. Plug in two joysticks and then type RUN. You'll see the title screen.

Using the function keys, you can control the hazards of the game. When The Anglers first runs, it is set up for the simplest game—you and your opponent simply fish as fast as you can. The first angler to score eight catches is the victor.

There are a maximum of three hazards in the game. When you're selecting hazards on the title screen, you'll see three fish. A fish indicates that no hazard is selected. Press F3, F5, and F7 to select hazards. The hazards are seaweed and speedboats. You could set up the game with no hazards (the default), a speedboat and a clump of seaweed, two clumps of seaweed and a speedboat, three speedboats, or any other combination. When you're ready to begin play, press F1.

The race is on. You'll see small ripples in the water when a fish is near. Use the joystick to move left and right along the bank of the lake so that you are lined up with the fish. To cast, press the joystick forward until it meets the fish. Pull back on the joystick until you bring the fish in. You'll see a hash mark appear to show you that you've caught a fish.

If you've set up hazards, watch out. A clump of seaweed could get caught in your line; you'll have to pull it in before you can catch your next fish. Or a speedboat could run over your line, hauling you into the drink. Steer clear of these hazards if you plan to win the game.

See program listing on page 75. **G**

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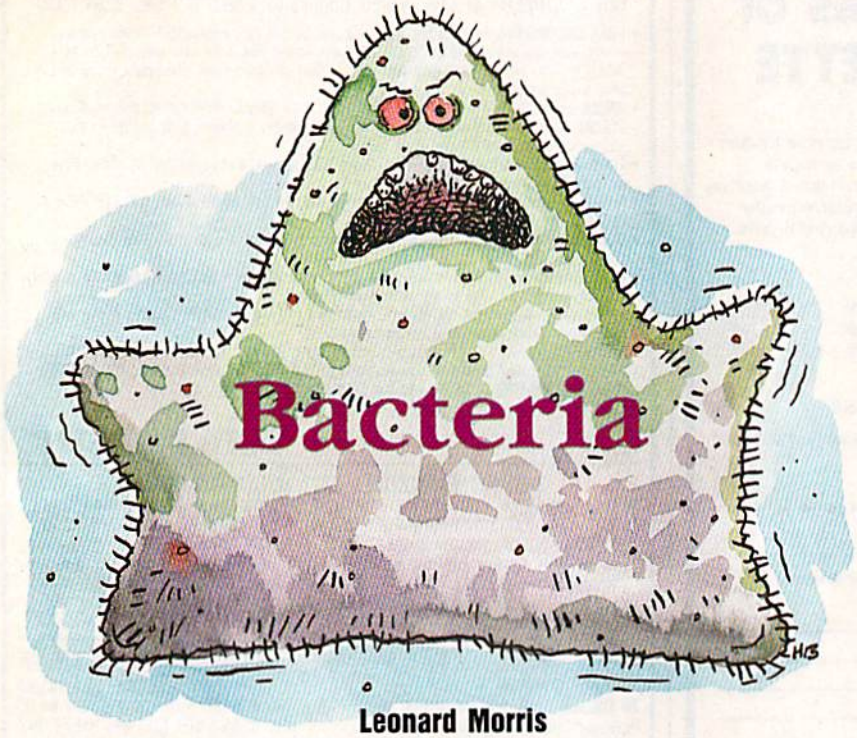


Bacteria

Arcade antiseptic for the 128. Joystick required.

Leonard Morris

It is the year 2008 and scientists have discovered a potent bacteria that cures practically all known diseases. Like many great scientific breakthroughs, however, this cure-all organism can be as deadly as it is life-giving. To retain its healthful properties, the bacteria must be contained within an irradiated Zenoff chamber. If the bacteria escapes its controlled environment, it will transform into a deadly virus and threaten the health of every human on earth.

In a freak laboratory accident, the core of a Zenoff chamber has been corrupted and scientists suspect that the bacteria may be leaking out. Using technology discovered in the late 1990s, you, a lowly lab technician, are reduced to microscopic size and injected into the chamber along with a specialized pulse laser. Using the laser, you are instructed to move around the perimeter of the chamber and shoot any bacteria that try to escape—a dangerous but vital task.

Getting Started

"Bacteria" is written in 128 BASIC. Type it in and save the program. Be sure to use "The Automatic Proofreader," listed elsewhere in this issue, to ensure that you don't make any typing mistakes.

To play Bacteria, switch to 40-column mode and then load and run the program. When it's first run, the screen goes blank, the computer emits some strange sound effects, and, after a short while, the game begins.

Fantastic Journey

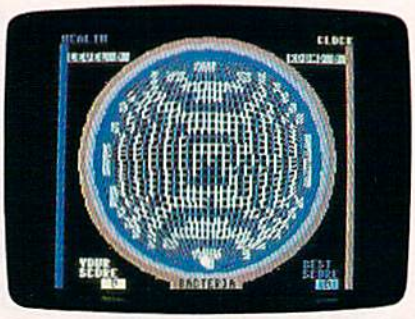
To a microscopic lab technician such as yourself, the inside of a Zenoff chamber looks much like a spherical spider's web. The bacteria, which escape from the center of the sphere, look like gigantic twirling insects.

Your movement is controlled by the joystick plugged into port 2. Move the joystick left and right to move clockwise and counterclockwise, respectively, around the perimeter of the chamber. The joystick's fire button shoots the laser. The laser beam may be visible or invisible, depending on the amount of bacteria hit with your previous blast.

A timer appears on the right side of the screen. A new round of bacteria zapping begins when the timer runs down. After five rounds, you move to the next level of the chamber. If you make it to level 3, you're doing great. The current round and level are displayed across the top portion of the screen. With each new round, an additional bacterium tries to escape.

Stay away from the bacteria. If any touches you, it dies and your health declines. If the health indicator, which appears on the left side of the screen, decreases to nothing, the game is over.

You are not alone on the chamber's perimeter. A mutant bacterium has made it to the outer wall and is encircling its perimeter. You should avoid this super germ at all costs. Your laser cannot destroy it, and touching it decreases your health substantially.



It's futuristic germ warfare in this arcade-action game for the 128.

Scoring

How much you score depends on your current level and round. For every blasted bacterium, your points increase by ten times the current round number. If you kill some bacteria with an invisible blast, your points increase even more. If you kill a bacterium by touching it, you earn 100 times the current level number. The high score and your current score appear at the bottom of the screen.

See program listing on page 69. **G**

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Many of you have told us that you've upgraded to the Amiga or that you will do so soon. We're happy to announce a new publication with everything an Amiga user could want—that's why we named it *COMPUTE!'s Amiga Resource.* Packed with a broad variety of solid information and a bold new look, each issue has a companion disk you won't want to miss. We're so excited about *Amiga Resource* that we're making a very special one-time offer to *Gazette* readers who have moved to an Amiga. You won't be disappointed.

—Lance Elko

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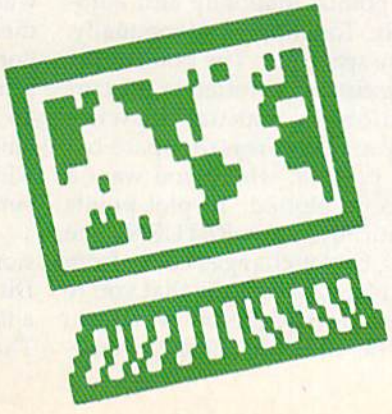

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PLANEBENDER

Victor Barbee

"Planebender" is a new type of drawing tool that you can use to create practical as well as fantastic designs. For example, its grid and effects options can help you create designs like those normally seen in stained glass, ceramic tile, or parquetry. It's also an excellent tool for designing screens for computer games.

Planebender has several features to make your job easier. It lets you draw on an ordinary flat canvas or in a multidimensional grid. You can mirror your drawing over the canvas or within the grid. You can even create 3-D shadowing effects. You can store your designs for later retrieval or print hardcopies on your printer. Planebender uses a keyboard interface to give you more accurate control over your drawing than you could achieve with a joystick.

Typing It In

Planebender is written entirely in machine language. Type it in using "MLX," the machine language entry program found elsewhere in this issue. When MLX prompts you, respond with the values given below.

Starting address: C000
Ending address: CD47

Type in the data for the program. Before exiting MLX, be sure to save a copy of the data to disk.

To begin using Planebender, load the program with a statement of the form LOAD"*filename*",8,1. Once the program has loaded, type NEW to reset BASIC's pointers. Type SYS 49152 to start up.

Fundamentals

The drawing area occupies most of Planebender's screen. Somewhere within this area, you should see the arrow-shaped drawing cursor. At the bottom of the screen, Planebender displays a window which contains information about the grid, current drawing options, and color selections.

Move the drawing cursor with the cursor keys. You can control the speed at which the cursor moves with the keys 1–9. Pressing 1 will slow the cursor to a crawl, while 9 is almost too fast to be useful when all the effects are turned off. (When several effects are active, the cursor slows down perceptibly.)

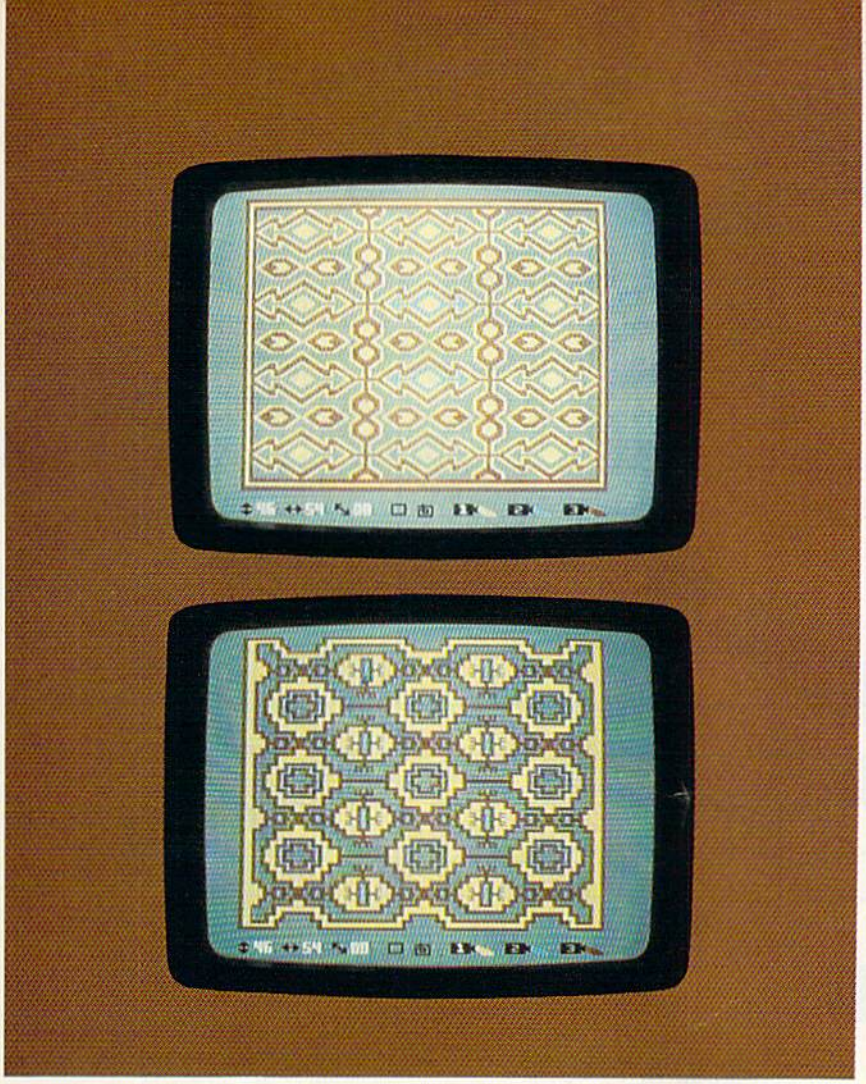
Planebender offers two ways to plot points: manually and automatically. To plot a point manually, press the space bar. The point at the drawing cursor is plotted in the current color. In manual drawing mode, you must press the space bar at each position where you want a point to be plotted. To plot points automatically, press RETURN. The drawing cursor changes color, from blue to black, to indicate that you're in automatic mode. Now when you move the drawing cursor, Planebender plots the points as it goes. Press RETURN again to turn off automatic plotting.

You can control the colors of your drawings with the function keys. Pressing f1 sets the drawing color to color 1; f3, to color 2; and f5, to color 3. Pressing f7 sets erase mode. If you make a mistake, simply press f7 to erase it. If you want to start over with a blank screen, press the ← (left arrow) key to clear the screen. Function keys f2, f4, f6, and f8 change, respectively, colors 1, 2, 3, and the background color.

Multiple Dimensions

The information window at the bottom of the display contains information about the grid settings, drawing modes, and colors. The three numbers on the left side of the window are the grid dimensions. The first number is the height of each grid cell, the second is the width of each cell, and the third is the horizontal offset of a cell in relation to the one above it. The default settings for the grid dimensions are 46 × 32 × 0. (Each grid cell is a rectangle 46 pixels high × 32 pixels wide, and the pixels are stacked vertically with no horizontal offset.)

You can set the grid dimensions by pressing the D key (think Dimensions). The screen clears and a field of dots appear on the screen. These dots represent the corners of



the grid cells. Use the up- and down-cursor keys to change the height of the cells, and the left- and right-cursor keys to change the width of the cells. Set the horizontal offset of the grid by pressing the space bar.

The screen is cleared when you set the dimensions of the grid, so be sure to save any work that you don't want to lose. The grid is displayed in the current drawing color—make sure you're not in erase mode when you try to set the dimensions. When you save your designs, the grid dimensions are also saved. If you plan to use the grid in your drawing, you must set its dimensions before you begin drawing.

Once you've set the dimensions of the grid, you're placed in grid mode. Now when you plot a point on the screen, it will be plotted in the same position in each of the cells. You can switch back and forth between grid mode and flat mode by pressing the C key (think Change canvas). The icon next to the grid dimensions indicates whether you're in grid mode or in flat mode. A hollow rectangle indicates flat-canvas mode; a matrix of dots indicates grid mode.

Special Effects

The next icon in the information window represents the special effect that's active. The default special effect is no effect. No effect is represented by the squiggle icon.

Press the E key (think Effect) to switch to the next effect, tapestry. If you're in flat mode, the tapestry effect causes Planebender to plot four points on the screen. For example, if you plot a point in the upper left corner of the screen, points are also plotted in the upper right, lower left, and lower right corners. This effect results in designs that have radial symmetry (designs that are symmetric in both the horizontal and vertical directions). If you're in grid mode, the tapestry effect plots four radially symmetric points within each cell of the grid.

Press the E key again to switch to the shadow effect. This effect is useful for creating the illusion of depth in your designs. When you use the shadow effect, every point you plot is highlighted by a second point, plotted down and to the right of the original. Planebender draws the shadow using color 3, so designs drawn in color 1 or 2 are most effective. It's a good idea to make color 3 a dark color. The shadow effect is represented by the *S* icon.

The Outside World

Planebender offers two ways to store your creative efforts: You can save them to disk or you can print hardcopies on your 1525-compatible printer. To save your drawing to disk, press the S key. The information window will be replaced by the word *SAVE* followed by a number. Use the up- and down-cursor keys to change the number and then press RETURN. Planebender saves your file with the name BEND.*XX*, where *XX* is the number you've selected.

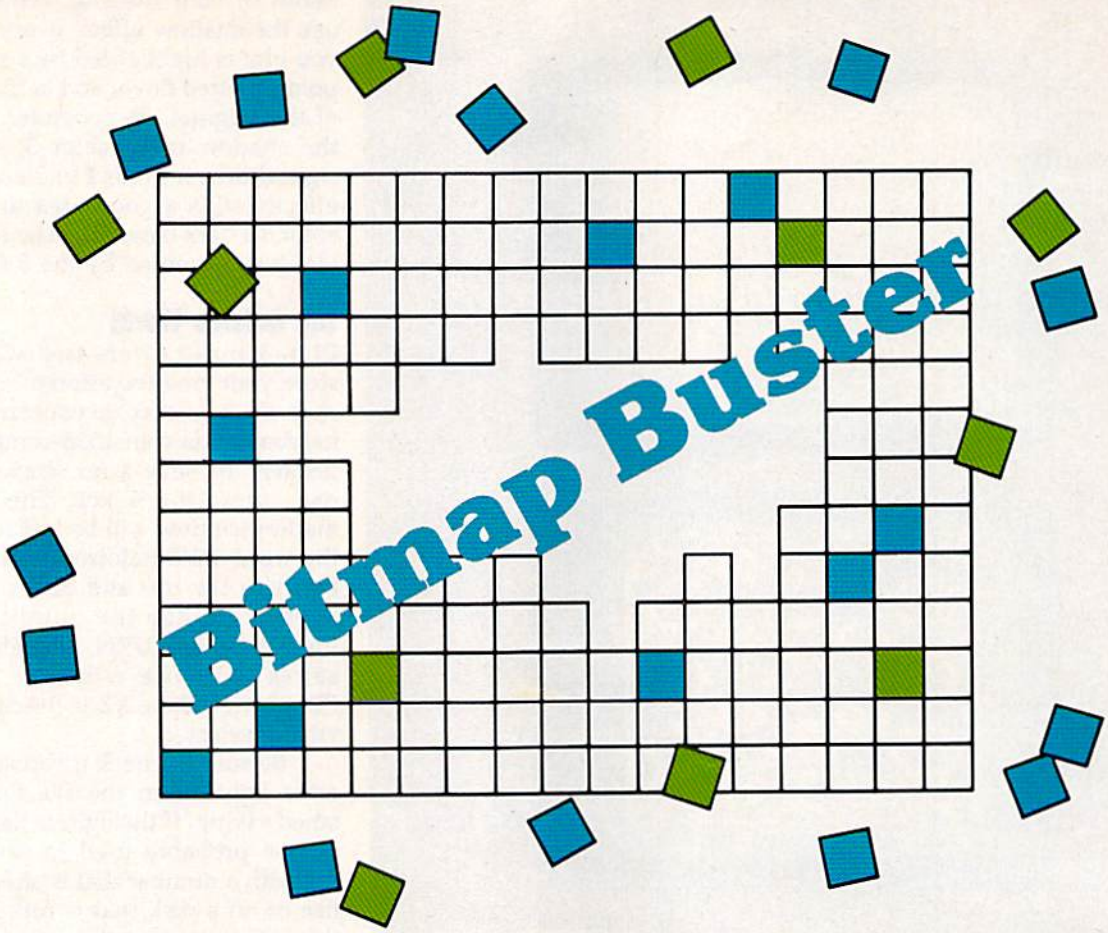
Be sure to check the disk drive error light when the file has finished saving. If the light is flashing, you've probably tried to save the file with a number that is already in use or on a disk that is full. If you think there's enough room on the disk, you can save again with a different number. If you want to replace a number that's already on your disk, press S and select the number as before, but press R instead of RETURN to save the file.

You can load a previously saved file by pressing the L key. As with the Save command, use the up- and down-cursor keys to set the number of the file you'd like to load, and then press RETURN. If you press the L key accidentally, you can cancel the command by setting the file number to a nonexistent file.

Print your drawings by pressing the P key. Planebender prints your drawing sideways on the page in double-wide format. If you prefer single-width output, type POKE 52079,1 after you've loaded the program but before you run it.

When you're using the Save and Print commands, the information window at the bottom of the screen is saved along with the drawing. Press the W key (think Window) to turn off the information window. Press the C key twice to restore the information window. **G**

See program listing on page 66.



Phillip A. Gilley

Grab hi-res screens from memory and save them to disk with this clever program for the 64.

"Bitmap Buster" is a canny utility that lets you borrow hi-res screens from just about any program. Bitmap Buster searches through the memory areas where bitmap screens are commonly stored. When you've found a screen, you can save it in one of three popular file formats—*Doodle*, Koala, or the standard hi-res dump format. You can use any paint program that supports these file formats to edit them and to add color.

Getting Started

Bitmap Buster is written entirely in machine language, so you'll need to use "MLX" to type it in. When MLX prompts you, respond with the values given below.

Starting address: 0801
Ending address: 0D80

After you've typed in all of the data, be sure to save a copy to disk before leaving MLX.

To use Bitmap Buster, you must first have a hi-res screen in memory. You can do this by running a game or any program that uses a hi-res screen. When you have the screen the way you want it, exit the program. Load Bitmap Buster and type RUN. Your bitmap image should remain undisturbed in memory. (If you have GEOS, and would like to see a quick demonstration of Bitmap Buster, load and run GEOS—which uses hi-res screens—exit it, and then load and run Bitmap Buster.)

At the main menu, press F1 to view the hi-res screens. If the image you want isn't there, press RETURN to cycle through all seven of the possible memory slots for hi-res screens. When you find the image, you can press F3 to reverse the colors and F5 to toggle multicolor mode on and off. To save the image, press F1 to go back to the main menu. Press F2, F4, or F6 to select the file format (*Doodle*, Koala, or standard); then enter a filename. If you choose the Koala format, you'll be asked to enter a letter that corresponds with a KoalaPad picture slot. To abort, just press RETURN without entering a filename.

From the main menu, you can press F3 to get a disk directory and F5 to change the current disk drive. When you've finished, press F8 to quit the program. *Doodle* and Koala files are automatically saved with the appropriate prefix. The standard file format saves an 8K bitmap starting at location $4000. (Note: Bitmap Buster does not save the color data in *Doodle* and Koala formats. You must go back and add or change the colors yourself.)

See program listing on page 74. **G**

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MONTHLY CALENDAR

Chris Brown

"Monthly Calendar" is great for keeping up with a busy schedule. You design your own calendars with personalized entries for birthdays, business appointments, and other special occasions. After you've created the perfect calendar, you can print it out or save it to disk. Monthly Calendar supports the MPS-801, 1525, and Star Gemini 10x printers (other printers may work if they support Commodore graphics characters).

Getting Started

Monthly Calendar is written entirely in BASIC, so be sure to use "The Automatic Proofreader," found elsewhere in this issue, when typing it in. Save a copy of the program before running it.

The main menu appears when you run the program, offering these eight options:

1. New Calendar
2. Year and Month
3. Memo
4. Enhance Dates
5. Print
6. Save
7. Load
8. Quit

Press the corresponding number or letter to select an option. New Calendar takes you through all the steps needed to create a calendar: Year and Month, Memo, Enhance Dates, Print, and Save. Each option can also be called directly from the menu.

New Calendar

The first time you run Monthly Calendar, press 1 or N to create a new calendar. You begin by entering the year and month. Input the full year—1989, not just 89. Monthly Calendar handles years ranging from 100 to 9999. For the month, enter either the number or the complete name spelled out. For example, you could enter either 3 or *March*. After you have entered the date, the computer brings you to the Memo option.

HERE'S A CALENDAR PROGRAM THAT'S ESPECIALLY USEFUL AND FLEXIBLE. IT OFFERS A NUMBER OF FEATURES AS WELL AS SMART-LOOKING OUTPUT. FOR THE 64. PRINTER REQUIRED.

Memo

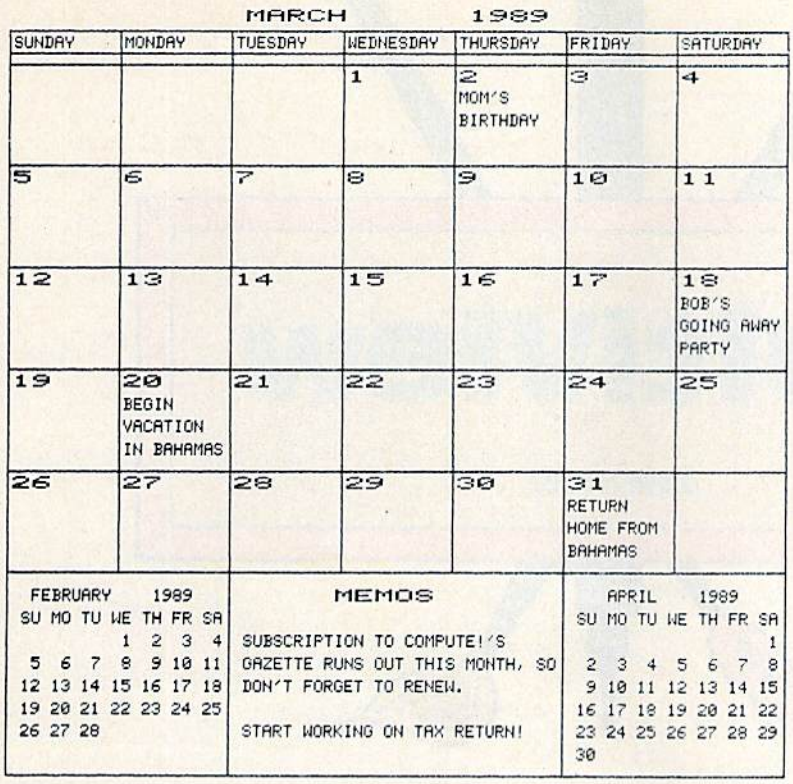
A memo consists of a message or note flanked by small boxes that show the previous and next months. It appears at the bottom of the calendar. When you're entering a memo, brackets frame an area of the screen to show how much text you can enter (six rows of 31 characters). The next and previous months are not displayed; they appear only when the calendar is printed. The cursor, INS/DEL, and CLR/HOME keys all function as expected. RETURN moves you to the beginning of the next line. You can include graphics characters, but lowercase letters are not allowed. Pressing the back-arrow key at any time or pressing RETURN when you're at the bottom of the memo area ends input.

Enhance Dates

Each day on the calendar has space for a short note. When the Enhance Dates option is selected, the current calendar is displayed on the screen. Enter the date you want to enhance, or enter Q to exit this option. Enhanced dates can have notes seven rows by ten characters wide. For best results, skip the first line and double-space your message. Editing works the same way it does with memo input. Press the back-arrow key or RETURN at the bottom of the input area when you've finished typing.

Enter another number to enhance that date, or enter Q to exit the Enhance Dates function. To edit a previously entered note, simply enter the number for that day.

Note: From time to time, the 64 needs to perform garbage collection on string variables. This can cause



MARCH 1989

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1	2 MOM'S BIRTHDAY	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18 BOB'S GOING AWAY PARTY
19	20 BEGIN VACATION IN BAHAMAS	21	22	23	24	25
26	27	28	29	30	31 RETURN HOME FROM BAHAMAS	

FEBRUARY 1989

SU	MO	TU	WE	TH	FR	SA
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

MEMOS

SUBSCRIPTION TO COMPUTE!'S GAZETTE RUNS OUT THIS MONTH, SO DON'T FORGET TO RENEW.

START WORKING ON TAX RETURN!

APRIL 1989

SU	MO	TU	WE	TH	FR	SA
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

the program to pause for several seconds during text entry.

Print

The Print option waits for a keypress before printing. This lets you make sure the printer is online and the paper is lined up properly. Press the back-arrow key to cancel. For new calendars, the memo bar is automatically included if you've entered Y at the *Included memo bar* prompt. If you choose Print from the main menu, however, the computer will prompt you again.

Save, Load, and Quit

The seventh option in the main menu and the last option in the New Calendar sequence is Save. When the computer prompts you, enter a filename and press RETURN. If a disk error occurs, the computer displays a brief error message and you are forced to reenter the filename. Enter a blank filename to exit this option.

When you save a calendar, the month, the year, and all memos and notes from each date are saved to disk. The memo and enhanced dates remain in memory until you select New Calendar, load a calendar, or select Quit from the main menu.

Load allows you to load a calendar from disk. Just select this option and enter the filename of the calendar you wish to load. Quit exits the program and returns you to BASIC.

Hints and Tips

Each of the commands described above can be executed directly from the main menu. This allows you to perform all sorts of calendar tricks. You can edit the memo and change individual enhanced dates. To find out what day of the week a special event occurs, select Year and Month and then choose Enhance Dates. The calendar for that month will appear onscreen. Simply enter Q at the *Enhanced date* prompt to return to the main menu.

Changing the year and month does not erase the memos or the enhanced dates. For example, you can save a February 1989 calendar and load it into February 1990. You can update the year, the memo, or any of the dates. If you had a note for February 14, it would stay on that date. Certain events, like paying the bills or getting haircuts, can occur the same date every month. For these events, being able to change the month makes a lot of sense.

See program listing on page 71. **G**

ADVERTISEMENT

Flight notes

5A

Exploring Japan with Jet (Part 2)- SubLOGIC's Jet program now includes a free Japan Scenery Disk. Last month we took you on a guided F-16 tour of Tokyo.

This month we'll follow the Japanese coastline on a cross-country flight from Tokyo to Osaka. Starting from Tokyo International Airport (coordinates North 18201, East 32787), take off and turn to a heading of 220 degrees until you reach the coast. Turn to a heading of 235 degrees and fly for about twelve minutes at five thousand feet altitude until you can see Hamamatsu Airport below you (see Tokyo area chart). Turn right again to a heading of 305 degrees and fly to Nagoya, another highly detailed city. At Nagoya, turn left to a 240-degree heading that will take you straight to Osaka. When you find yourself flying over Osakajo Castle, begin your descent for a landing at Osaka International. This entire flight takes only twenty five minutes at Mach 1.4.

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There is no graphics standard on the Commodore 64. In fact, almost every single paint program has its own method for storing pictures. As long as you stick to one paint program, you're fine. But what if you want to view a picture downloaded from a bulletin board or information service? "MultiView" is the answer.

With MultiView, you can start your own art collection. Ten popular formats are supported, including *Doodle*, *KoalaPad*, and *Blazing Paddles*.

With the variety of storage formats used by 64 paint programs, users are often limited by what they can display. Here's a program that can display pictures created by ten popular paint programs. Disk drive required.

Getting Started

MultiView consists of two programs. Program 1, written in BASIC, is the main program. Program 2 is the machine language program. When you type in Program 1, use "The Automatic Proofreader," found elsewhere in this issue. When you've finished typing, save a copy to disk using the filename MULTIVIEW. Next, type in Program 2 using "MLX," the machine language entry program found elsewhere in this issue. After you've loaded and run MLX, the prompts for the starting and ending addresses will appear. The MLX prompts, and the values you should type in, are as follows:

Starting address: C000
Ending address: C23F

Enter the data for Program 2. Before exiting MLX, be sure to save a copy of the program to disk using the filename MULTIVIEW.ML. It is very important that you use this name, since Program 1 attempts to load a program of that filename when it is run.

When you're ready to use MultiView, load Program 1 and type RUN. Program 2 loads automatically. Then you're presented with the main menu.

Press 1 to load and view a picture. You'll see the picture-format menu. You may select from one of the following picture formats: *Doodle, KoalaPad, Create with Garfield, Print Shop, Paint Now!, Advanced Art Studio, Rainbow Painter, PaintBrush, Blazing Paddles,* or standard-format lo-res pictures.

Use the cursor keys to highlight your choice and then press RETURN. Next, type in the name of the picture you wish to load. Be sure to include any special prefix or suffix that appears in the filename. For example, *KoalaPad* files are preceded by a reverse spade character. You'll have to type " (double quotation marks), Commodore-1, the filename, and " to load a *KoalaPad* file. Also, be sure to include the spaces at the end of the filename. (For more information on typing special characters, see "How to Type In *COMPUTE!'s Gazette* Programs," elsewhere in this issue.)

MultiView displays the picture. When you've finished viewing, press f1 to return to the main menu.

To see a disk directory, select option 2 from the main menu. Press 3 to exit the program and return to BASIC.

See program listings on page 67. **G**

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USER GROUP Update

Mickey McLean

The following list includes updated entries to our annual "Guide to Commodore User Groups," which last appeared in the May and June 1988 issues.

Send typed additions, corrections, and deletions for this list to

Commodore 64/128 User Group Update
COMPUTE!'s Gazette
P.O. Box 5406
Greensboro, NC 27403

When writing to a user group for information, please remember to enclose a self-addressed envelope with postage that is appropriate for the country to which you're writing.

New Listings

ALABAMA

Coosa Valley Commodore Club (CVCC), P.O. Box 1893, Gadsden, AL 35902-1893

INDIANA

Alliance of Commodore Enthusiasts (ACE), 1315 Catula Ave., Lafayette, IN 47905

NEW JERSEY

Universal Software Incorporated, 83 Bald Eagle, Hackettstown, NJ 07840

OKLAHOMA

Osage/Kay Commodore User's Group (OKCOM), 317 Woodbury, Ponca City, OK 74601

PENNSYLVANIA

The Scranton Commodore Users Group (SCUG), 499 Mulberry St. #804, Scranton, PA 18503

Outside the U.S.

APO

Alconbury Commodore Computer User's Group, Attn: MSgt. Willie J. Johnson, Box 58, APO, NY 09238-5000

PAKISTAN

TIGLON, c/o Ahmed Jamal, P.O. Box 7237, A.H. Rd., Karachi-74400, Pakistan

PUERTO RICO

Commodore Users Exchange, c/o J. S. Cardona, P.O. Box 1601, Caguas, Puerto Rico 00626-1601

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Deutscher Computer Club, Alexander V. Schinzing, Auf der Grube 13, D-3440 Eschwege 6, Federal Republic of Germany **G**

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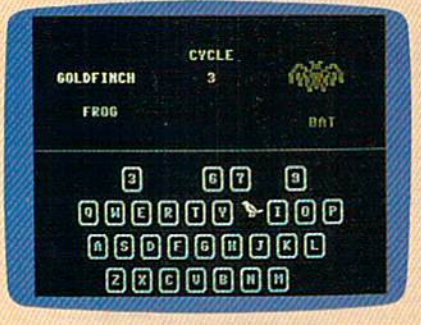

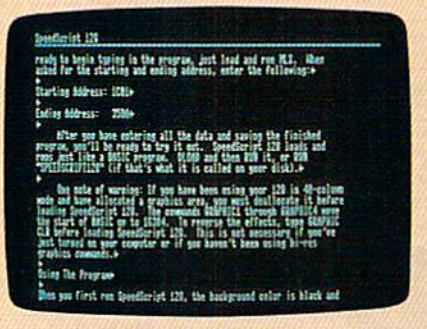

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feedback

Do you have a question or a problem? Have you discovered something that could help other Commodore users? We want to hear from you. Write to Gazette Feedback, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We regret that, due to the volume of mail received, we cannot respond individually to programming questions.*

Robotic Workshop

My son and I share a Commodore 64 and are interested in computer-controlled robotics. We've heard through word of mouth that a robotic kit exists for the 64. Do you have any information on this kit?

Vernon Purchase
Hawthorne, CA

Multibotics makes a robotics package for the Commodore 64. Based on the popular Capsela line of building components (plastic-encapsulated gear units), the MB230 home package includes 32 Capsela parts (including two motors, worm gear, transmission, axle, and wheels), a computer interface cartridge, Robot Operating System software, and a manual. The interface cartridge plugs into the user port and can control up to three motors (only two are included in this package).

To help you learn the system, instructions are included for 52 different projects. These include an oscilloscope, a voltmeter, an infrared sensor, and a high-quality speech synthesizer. The Robot Operating System software adds commands to BASIC so that you can readily program the finished products.

Another plus with this system is that it's expandable. Additional Capsela parts are available at major toy stores and hobby shops. After you've completed all 52 projects, you can use the knowledge and skills you've gained to modify existing projects or design custom ones of your own.

The price for the entire Multibotics package is just under $100. For more information, contact Multibotics, 545 West 500 South, Suite 130, Bountiful, Utah 84010; (800) 824-2549 (Multibotics is a subsidiary of Access Software).

Losing Color

I have been playing "Scorpion II" from the October 1988 issue of *Gazette*.

When the cards are dealt, they are the proper color. The hearts and diamonds are red, and the spades and clubs are black. However, they do not remain that way when they are placed on the table. Instead, all of the cards turn black. I have been waiting for a correction or revision, but none has appeared. Would you please advise me how to get the colors to stay?

T. A. Schaefer
St. Petersburg, FL

Sorry, it just can't be done. "Scorpion II" uses the hi-res mode of the 64. A limitation of this mode is that you can only have two colors in any 8 × 8 pixel cell (these cells correspond to the positions of ihe characters in text mode). Since the cards overlap on the table, their colors could not be retained. Sprites are used to move the cards, so the colors appear correctly when the cards are dealt. If the programmer had used multicolor mode, all the cards could have appeared in the correct color. However, multicolor mode has only half the resolution of hi-res, so the cards would have been difficult to identify.

Entering *Gazette* Programs

I type in a lot of programs from *Gazette* which have numerous DATA statements. The first time I run one of these, I often get a DATA statement error, indicating that I've made one or more mistakes in my typing. Is there a formula that can be added to a program to tell you in which line the DATA error occurs?

Chris Buckley
Demascus, MD

The type of program you're referring to is a BASIC loader—a program that contains sprite data or a machine language (ML) routine in its DATA statements. The loaders we publish generally read in the data, POKE it into memory, and then check for a DATA statement error. If the data values fail to add up to a given checksum, an error message is printed.

From time to time, a loader with a line-by-line checksum routine appears in the magazine. Such loaders use a separate checksum for each line of data (the checksum is usually the last number on the line). So, when a data error does occur, you're told exactly which line contains the offending value.

As a rule, we rarely add line-by-line checksum routines to our programs. If they appear at all in the magazine, it's because they were furnished by the original programmer and we simply left them in place. As far as we know, there's no set formula that can be added to an existing program to emulate a line-by-line checksum without considerably modifying the program.

One possible solution to your problem is to use "The Automatic Proofreader," which is found in the back of each issue of Gazette. *This program is designed specifically to help you achieve error-free entry of our BASIC program listings—including loaders. Once active, it displays a checksum for each BASIC program line you enter. If this checksum agrees with the one given for that line in the listing, you can be almost certain there are no mistakes in your typing. Unlike line-by-line checksum routines, the Proofreader requires no ad-*

ditional typing and even lets you catch transposition errors—errors which occur when you inadvertently reverse the order of successive characters in the listing.

If you're currently using the Proofreader and still have trouble entering our programs, you may want to consider subscribing to the Gazette Disk, *which contains all the programs—both BASIC and machine language—that appear in the magazine.*

Bugs in the 128

The following program works on a 64 with a *Super Expander* cartridge but fails on my 128.

```
10 GRAPHIC 1,1:COLOR 1,2
20 DRAW 1,60,60 TO +30,+25
30 SLEEP 1
40 DRAW 1 TO +20,+30
50 SLEEP 1
60 DRAW 1 TO -20,+30
```

When I run this program, I get an ?ILLEGAL QUANTITY ERROR in line 60. Apparently, BASIC 7.0 won't accept a negative argument in the DRAW TO statement. But according to my 128 manual, it should. What gives? Is my computer defective?

Noel G. Biles
Fairfield, CA

Certain bugs—like the one you've described here—exist in 128s with original ROMs. When Commodore became aware of these problems, the company corrected them with a set of replacement ROMs. To obtain the upgraded ROMs, contact Commodore or your Commodore dealer. (There are also ROM upgrades for the 1571 drive.)

For those who are unsure whether their 128 needs a ROM upgrade, there's an easy way to find out. Instead of entering and running the program above, just PEEK location 65408 (from 128 mode). Original 128s return a 0 (for version 0); newer ones return a 1.

Formatting Numeric Output

I run a small service business, and many of my customers pay after being billed on the first of the month. My Commodore 64 won't print 00 after the decimal point. How can I make it print a number like $125.00?

M. L. Blinn
Vista, CA

BASIC's PRINT command doesn't print trailing zeros after integers. More precisely, it doesn't print trailing zeros after any number. This means that if you assign a value of 1.10 to N and then print N, what appears is 1.1.

Since you're trying to print dollar amounts, you want each value to be displayed to two places past the decimal. In doing this, you need to check for two special situations: First, when the value represents a whole dollar amount (like $125.00), and second, when the value has a zero in the hundredths place (like $1.10). In both cases, BASIC drops the trailing zeros.

To handle whole dollar amounts, you can check for an integer value with a line like this:

```
10 IF N=INT(N) THEN (DO SOMETH
     ING)
```

After finding that N is an integer, what do you do next? You could print a decimal point and two zeros. But since BASIC 2.0 contains many functions for manipulating strings and none for formatting numeric output, a better approach would be to convert N to a character string and then add the trailing zeros:

```
10 N$=STR$(N):IF N=INT(N) THEN
     N$=N$+".00"
```

Numbers like 1.10 could be dealt with in a similar fashion:

```
10 N$=STR$(N):IF N*10=INT(N*10
     ) THEN N$=N$+"0"
```

To take care of either situation, you could incorporate both lines into a single subroutine:

```
100 N$=STR$(N):IF N=INT(N) THE
     N N$=N$+".00":GOTO 120
110 IF N*10=INT(N*10) THEN N$=
     N$+"0"
120 PRINT "DOLLAR AMOUNT IS "N
     $
130 RETURN
```

To see this routine in action, add the following lines:

```
10 N=125.00:GOSUB 100
20 N=125.30:GOSUB 100
30 N=125.60:GOSUB 100
40 END
```

and run the resulting program. The first and second values of N print correctly (as 125.00 and 125.30, respectively). But something odd happens with the third value. It prints as 125.6. This is because the computer represents numbers in binary. As a result, a slight rounding "error" is introduced and 125.6 slips through the routine.

To take care of this glitch, replace line 110 with the one below:

```
110 IF MID$(N$,LEN(N$)-1,1)=".
     " THEN N$=N$+"0"
```

Now instead of looking at the number, you're examining the corresponding string. If the next-to-last character in the string is a decimal point, you add a zero.

The last thing you need to be sure of is that amounts on the bill have no more than two digits after the decimal point. Because of the math involved, the computer may express certain calculated values—like labor charges—to more than two decimal places. To ensure that our subroutine rounds to two digits, change line 100 to read

```
100 N=INT(N*100+0.5)/100:N$=ST
     R$(N):IF N=INT(N) THEN N$
     =N$+".00":GOTO120
```

The expression we've inserted at the beginning of this line multiplies the number N by 100 to move the decimal point two places to the right, adds 0.5 to round the value, removes the extra digits, and divides by 100 to return the decimal point to its original position.

Finally, to test the finished subroutine, replace lines 10 and 20 with those below:

```
10 INPUT "ENTER A VALUE";N:IF
     {SPACE}N<0 THEN END
20 GOTO 10
```

and run the program.

Monitor Blackout

When the same screen is displayed on my monitor for long periods of time, the image remains even after I clear the screen and print something else. I'm afraid this will permanently damage my monitor. Could you provide me with a program for my 64 that will blank the screen if the user doesn't press a key for a specified time?

John Lewis
Fort Hood, TX

The machine language program listed here blanks the screen to the current border color if a keypress doesn't occur within five minutes.

The routine runs off the IRQ interrupt. IRQ interrupts take place

once every 1/60 second on the 64. During the interrupt, the computer performs certain "housekeeping" routines: It updates the jiffy clock, flashes the cursor, scans the keyboard for a keypress, and so on. The 64 locates the code for these routines using the two-byte pointer, or vector, *at location 788. Ordinarily, this vector points to location 59953.*

The first part of the program (see box) points the IRQ interrupt vector at 788 to our custom screen-blanking routine (BLANK). It also sets the jiffy clock (locations 160–162), which serves as our timer, to 0.

Each time BLANK is called, it checks for a keypress. If one has occurred, it zeros the clock, turns on the video display by setting bit 4 of location 53265, and exits through the normal interrupt routine.

If no key has been pressed, the routine checks the screen display. If it's off, the routine exits to BASIC. Otherwise, it examines the timer to see whether it has reached the specified limits (in this case, five minutes). If it has, the routine blanks the screen display and exits.

The program below is a BASIC loader which contains the machine language routine:

```
BQ 10 FORI=828TO895:READA:POKE
      I,A:X=X+A:NEXT
JA 20 IFX<>7939THENPRINT"DATA
      {SPACE}STATEMENT ERROR."
      :STOP
CB 30 SYS828
AR 40 DATA 120,169,76,141,20,3
AA 50 DATA 169,3,141,21,3,32
PD 60 DATA 119,3,88,96,165,197
FH 70 DATA 201,64,240,14,32,11
      9
KE 80 DATA 3,173,17,208,9,16
XR 90 DATA 141,17,208,76,49,23
      4
XM 100 DATA 173,17,208,41,16,2
       40
FE 110 DATA 246,165,161,201,71
       ,144
FG 120 DATA 240,173,17,208,41,
       239
GM 130 DATA 141,17,208,208,230
       ,169
MF 140 DATA 0,133,160,133,161,
       133
BK 150 DATA 162,96
```

To install and activate the screen blanker, just type RUN.

If you'd prefer a longer or shorter delay before the screen blanks, adjust the number 71 in line 110. This byte represents the number of 256-jiffy intervals (4.2267 seconds) that take place between keystrokes before the screen is blanked. If you wanted the delay to be only two minutes, for instance, you'd change the 71 to a 28 (120/4.2267=28.4). At the same time, you'd need to adjust the checksum in line 20.

```
; Screen blanker
; First, redirect IRQ vector to BLANK.
            SEI             ;disable IRQ interrupts
            LDA #<BLANK     ;store BLANK address in vector
            STA 788
            LDA #>BLANK
            STA 789
            JSR ZEROCLK     ;go zero jiffy clock
            CLI             ;reenable IRQ interrupts
            RTS             ;and return to BASIC
;
BLANK       LDA 197         ;check for last keypress
            CMP #64         ;Has no key been pressed?
            BEQ SCRBLK      ;Yes, so check screen.
            JSR ZEROCLK     ;A keypress has occurred. Reset timer
            LDA 53265       ;and turn on screen.
            ORA #%00010000  ;turn on bit 4
            STA 53265
EXIT        JMP 59953       ;execute normal IRQ interrupts
;
SCRBLK      LDA 53265       ;Is screen blank?
            AND #%00010000  ;(bit 4 controls screen blanking)
            BEQ EXIT        ;Yes, so leave.
            LDA 161         ;Has time expired?
            CMP #71         ;(timer set for 71 × 4.2267 secs, or 5 min.)
            BCC EXIT        ;No, so exit.
            LDA 53265       ;Yes, so blank screen.
            AND #%11101111  ;turn off bit 4
            STA 53265
            BNE EXIT        ;and leave
;
ZEROCLK     LDA #0          ;Zero jiffy clock to "000000"
            STA 160
            STA 161
            STA 162
            RTS
```

Stereo SID Chips

I have written a machine language program for the 64 that was intended to triple the number of voices in the SID chip by rapidly storing three different sets of SID values into the chip. When I tried to use it, the chip produced a mixture of garbled noises rather than the sounds I had programmed. What's wrong with my program?

Michael Franz
Idaho Falls, ID

You're attempting to do the impossible. To achieve a smooth transition between musical notes, each waveform must complete its cycle before you store a new set of values in the chip. In your program, you're rapidly copying shadow register data for all three voices into the chip while the previous waveforms are still in progress. This produces the garbled effect that you're hearing.

We've heard of a method for doubling (but not tripling) the number of voices in the 64 that may interest you. In the November 1988 issue of "Open Forum" (a newsletter published by the Diablo Valley Commodore Users Group), there's an article by Mark A. Dickenson that describes how to install a second SID chip in the 64. The author recommends that someone familiar with electronics assist you when you take on this project. (There's a chance you could permanently damage your computer.) Also, you'll need to purchase about $25 worth of parts. If you're still interested, you can obtain a reprint of this article by sending $1 and a stamped self-addressed envelope to

Stereo SID Reprint
Diablo Valley Commodore
Users Group
P.O. Box 27155
Concord, California 94527 **G**

BASIC for beginners

Small Stuff

Larry Cotton

This month we'll begin looking at several small but significant BASIC topics: CHR$( ), E, minute (and enormous) numbers, and calculated array subscripts. All these can be demonstrated in one simple program.

I design products for a power-tool company. Since we're internationally based, the parts for our tools are dimensioned in the metric system. This system of measurement, as you may know, is used almost exclusively outside the U.S. and Great Britain, which still use the English system. Although I grew up with the English system, I've come to prefer the metric system.

The program we'll begin writing this month converts the most common units of *length* from one system to the other. Of course, we could convert area, volume, weight, mass, temperature, and many other units of measurement. But to keep our program short, we'll just concentrate on length conversions.

In the English system, the most familiar units of length are the inch (in.), foot (ft.), yard (yd.), and mile (mi.). In the metric system, the most common are millimeter (mm), centimeter (cm), meter (m), and kilometer (km).

Getting Started

Let's get started by defining the text color. I like white; it's very readable and it goes well with most background colors. Here's one way to print white characters:

```
10 PRINTCHR$(5):REM WHITE
   CHARACTERS
```

CHR$( ), when used in conjunction with PRINT, can print, change the appearance of, or even remove characters on the screen, as well as move the cursor. In order for this function to be valid, a number in the range 0–255 must be specified within the parentheses. Of course, CHR$( ) has many other uses besides its use with PRINT.

On most computers, the ASCII codes 65–90 represent the letters of the alphabet. Thus, when you type PRINT CHR$(65) and press RETURN, an *A* is displayed on the screen. Other ASCII codes print numbers or symbols, move the cursor, and change the character colors.

For instance, when the number in parentheses is 5 (as in our program line above), the characters are printed in white. If it were 158, the characters would be yellow. (Consult your *User's Guide* for the complete list of ASCII and CHR$ codes.)

Now let's change the background color of the screen to black so that it contrasts with our text color. This can't be done using PRINT CHR$( ); instead, it requires a POKE, a command we've yet to cover:

```
20 POKE53281,0:REM BLACK SCREEN
   (USE POKE65301,0 ON THE PLUS/4
   OR COMMODORE 16)
```

Of course, if you don't like these colors, you can change them to your liking.

The Constants

Next, we should think about how the program will work. We'll want the user to enter values that will be multiplied by constants (so-called *conversion factors*) to get other values. If we convert each of the four English units to four metric units, we'll need 16 constants.

Let's put them into a 16-element array, which we dimension with DIM. (Remember that DIM defines or declares the number of elements in an array.)

```
30 X=16:DIMC(X)
```

Next, we'll set up a FOR-NEXT loop to read the constants into the array:

```
40 FORN=1TOX:READC(N):NEXT
```

We need some data to read. I've calculated the conversion factors for you; they're all based on one inch equaling exactly 25.4 millimeters. Let's start our DATA statements at line 1000 and renumber the program later:

```
1000 DATA .0000254,.0254,2.54,25.4
1010 DATA .0003048,.03048,30.48,304.8
1020 DATA .0009144,.9144,91.44,914.4
1030 DATA 1.609344,160.9344,16093.44,
     160934.4
```

The program is actually runnable at this point. In fact, let's run it. After a slight pause, the READY prompt will appear. To examine an element of our array, type PRINT C(N), substituting a number in the range 1–16 for N. Try several values of N. Some of the constants may look a little strange; more on that next month.

The Menu

Now that we've safely stored our groups of data in their 16 pigeonholes, let's create an option menu. Start by clearing the screen—which gives us another chance to use CHR$( ):

```
50 PRINTCHR$(147):REM CLEAR
   SCREEN
```

ASCII code 147 represents a screen clear on Commodore computers. Now the menu:

```
60 PRINT"(1) IN TO KM
70 PRINT"(2) IN TO M
80 PRINT"(3) IN TO CM
90 PRINT"(4) IN TO MM
100 PRINT"(5) FT TO KM
110 PRINT"(6) FT TO M
120 PRINT"(7) FT TO CM
130 PRINT"(8) FT TO MM
140 PRINT"(9) YD TO KM
150 PRINT"(10) YD TO M
160 PRINT"(11) YD TO CM
170 PRINT"(12) YD TO MM
180 PRINT"(13) MI TO KM
190 PRINT"(14) MI TO M
200 PRINT"(15) MI TO CM
210 PRINT"(16) MI TO MM
220 INPUT"{DOWN}WHICH
    OPTION";N
```

Run the program again. The menu will appear and you'll be asked to enter a number which

matches the conversion you wish to make. What happens if the user types a number that doesn't make sense? Several IF-THENs will weed out unacceptable numbers:

```
230 IFN<1ORN>16THEN50
```

If a number outside the desired range is entered, these lines send control back to line 50, which clears the screen and reprints the menu. Now let's ask the user to type in the number of units he or she wants to convert:

```
240 INPUT"{DOWN}QUANTITY";Q
```

Smart and Friendly

Well, that gets the job done, but it lacks two things: friendliness and intelligence. How can we make our program a little smarter and less intimidating?

The computer knows which conversion the user wants by the number he or she types in. For example, if it's 4, the user wants to convert a number of inches to an equivalent number of millimeters. So let's change line 240:

```
240 INPUT"{DOWN}QUANTITY OF
    INCHES";Q
```

That works great! Or does it? Suppose the user asks for a foot-to-kilometer conversion. We could add some IF-THENs to handle all possibilities, but there's an easier way.

Let's make IN, FT, YD, and MI string constants. While we're at it, let's make the abbreviations for the metric units constants as well. And since they're associated with the conversion constants we've already set up as data. . . .

But are we getting too carried away with trying to make the program more compact? I don't think so. Look at what we can do with just a few changes.

First, go back and change line 30 to dimension two more arrays of 16 elements:

```
30 X=16:DIMC(X),I$(X),M$(X)
```

Now add the units associated with the conversion constants to the DATA lines. In other words, the first constant, .0000254, converts inches to kilometers. It's not necessary to retype the entire lines; just open up some spaces and add the extra data.

```
1000 DATA .0000254,IN,KM,.0254,IN,
     M,2.54,IN,CM,25.4,IN,MM
1010 DATA .0003048,FT,KM,.03048,FT,
     M,30.48,FT,CM,304.8,FT,MM
1020 DATA .0009144,YD,KM,.9144,
     YD,M,91.44,YD,CM,914.4,YD,MM
1030 DATA 1.609344,MI,KM,160.9344,MI,
     M,16093.44,MI,CM,160934.4,MI,MM
```

Carefully note the order in which the 16 groups of data are arranged: a numeric constant followed by two string constants. Line 40 must be changed to read the data in exactly that order:

```
40 FORN=1TOX:READC(N),I$(N),M$
   (N):NEXT
```

Now we can change line 240 to use our friendly string constant:

```
240 PRINT"{DOWN}QUANTITY OF "I$
    (N);:INPUTQ
```

Born to Run

It's a good idea, when writing a BASIC program, to save it in running condition if you can. That way, when you return to the program later, you can more easily follow what you've done up to that point.

Even though our program isn't quite finished, it's still runnable. If you run it, you'll see that the DIM and FOR-NEXT statements work properly and that the menu prints in white characters on a black screen. And after you've run it, you can also test all the menu options by typing PRINT C(N), I$(N), M$(N), where N is in the range 1–16. The values should match those in the corresponding positions in the DATA statements. Remember that the data is arranged in 16 groups of three items: the conversion factor and its two unit abbreviations.

Almost Done

We've come to a good stopping point. The final program as I've written it converts length dimensions both ways—from English to metric and back again—but it still uses only 16 constants. Try to finish it yourself.

Here's a hint: The menu must double in size (keep it on one screen), and lines 230 and 240 must change once more to accommodate more options.

By the way, here's one for you trivia buffs: The meter is equal to exactly 1,650,763.73 wavelengths in a vacuum of the radiation corresponding to the transition between the levels $2p^{10}$ and $5d^5$ of the krypton-86 atom. **G**

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THE programmer's page

Tips from Readers

Randy Thompson

"The Programmer's Page" is interested in your programming tips and tricks. Send all submissions to The Programmer's Page, COMPUTE!'s Gazette, *P.O. Box 5406, Greensboro, North Carolina 27403. We'll pay $25–$50 for each tip we publish.*

Submissions to "The Programmer's Page" are beginning to overtake my desk. That's OK, though—there are some good hints in this stack, and I hope to publish them all. Listed here are just a few of the fine tips that I've received.

40-Column RGB

128 owners can use the following commands to achieve 40-column text on the 80-column RGB screen:

```
SYS 52684,63,0:SYS 52684,40
,1:SYS 52684,55,2:SYS 52698
,,25:RREGA:SYS 52684,(A OR
{SPACE}16),25:SYS 52684,137
,22:SYS 52684,40,28:WINDOW
{SPACE}0,0,39,24
```

These commands reconfigure the 128's 80-column display chip to produce characters that are twice as wide as normal. The 128 must be in 80-column mode for this to work. There are some side effects to this trick: Although the characters appear in 40 columns, the computer still thinks it's writing to an 80-column–wide screen.

To return the computer to normal, press RUN/STOP–RESTORE.

Tony Phillips
Ballwin, MO

No-Blink Cursor

For a change of pace, try this short machine language routine that keeps the cursor from blinking on the 64.

```
10 FOR I=49152 TO 49175:READ D
   :POKE I,D::CK=CK+D:NEXT
20 IF CK<>2660 THEN PRINT "ERR
   OR IN DATA STATEMENTS":END
30 SYS 49152
40 DATA 120,169,13,141,20,3,16
   9,192
50 DATA 141,21,3,88,96,165,207
   ,240
60 DATA 4,169,2,133,205,76,49,
   234
```

Type it in, save a copy, and then run it. The cursor will appear as a nonblinking inverse character. You can disable this routine by pressing RUN/STOP–RESTORE. Enter SYS 49152 to reenable it.

Ken Power
Winnipeg, Manitoba
Canada

128 Joystick Reader

This short but useful routine for the 128 reads the joystick in port 2 and adjusts a pair of *x* and *y* coordinates accordingly. If you move the joystick up, the *x* coordinate is decreased; if you move the joystick right, the *y* coordinate is increased; if you move the joystick down, the *x* coordinate is increased; and so on. The variable K determines how much the *x* and *y* coordinates are increased or decreased.

```
10 K=1:Q$="0012221000"
20 N=JOY(2):IF N THEN X=X+K*(V
   AL(MID$(Q$,N+2,1))-1):Y=Y+K
   *(VAL(MID$(Q$,N,1))-1)
```

This routine uses the joystick's direction value to index into the string variable Q$. Each character in Q$ indicates whether to increase or decrease the *x* and *y* coordinates. The character 0 specifies upward movement or movement to the left; the character 1 specifies no movement; and the character 2 specifies downward movement or movement to the right.

You don't have to understand how the joystick routine works to use it. It's easy to incorporate in your own programs. For example, by adding the following two lines, you create a simple drawing program:

```
5 GRAPHIC 1,1:X=160:Y=100
25 DRAW 1,X,Y:GOTO 20
```

Note that the joystick routine does not limit the value of *x* and *y*, so it's possible for the coordinates to go beyond the screen's boundaries.

David C. Hoelscher
Blacksburg, VA

64 POKEs

"The Programmer's Page" listed several POKEs for the 64 in the November 1988 issue of *COMPUTE!'s Gazette*. Here are some more:

POKE 819,2	Disable SAVE
POKE 819,245	Reenable SAVE
POKE 774,0	LIST shows line numbers only
POKE 22,35	LIST won't show line numbers
POKE 775,121	LIST locks up computer
POKE 775,234	LIST prevents lines from being entered
POKE 775,100	LIST performs a NEW

Izzet Ergas
Miami Beach, FL

Calling DOS

While many programmers use the DOS wedge commands in direct mode, few know the syntax for using these commands from within a BASIC program. The @, >, /, %, ←, or ↑ symbols appear first in a statement, as usual, but the rest of the command must be enclosed in quotation marks. For example, the following demo program lists the disk directory, saves the current program, displays the disk's error channel, and then runs the first program on the disk:

```
10 @"$"
20 <"FILENAME"
30 @
40 ↑":*"
```

This technique works for every wedge command I've tested.

Joseph Charnetski
Plains, PA **G**

power BASIC

On Break Goto

Matthew P. Gilbert

Make your BASIC programs user-friendly with this machine language utility. Instead of simply disabling the STOP key, you can add an ON BREAK GOTO command to your 64 and even more powerful ON BREAK commands to your 128.

One important feature of a good program is error trapping. For example, if you ask the user to input a number, your program should read only numeric characters. To make their programs bulletproof, many programmers disable the STOP key to prevent the user from halting the program at an awkward time (like during a save or load). An even better idea is to trap for the STOP key so you can take appropriate action when it's pressed.

"On Break Goto" was designed for this purpose. When it's activated, the 64 version of On Break Goto continually scans for a press of the STOP key. If this key is pressed, On Break Goto automatically jumps to a specified line in your program.

The 128 version of On Break Goto is even more powerful. It can perform a variety of BASIC commands, like jumping to a subroutine, displaying a directory, or even running another program.

Getting Started

Both versions of On Break Goto are written in machine language, but they're listed here as BASIC loaders. Commodore 64 owners should type in Program 1 using "The Automatic Proofreader," found elsewhere in this issue. This program POKEs On Break Goto into memory and activates it. It then goes into an infinite loop in line 110. Press the STOP key to break out of the loop. Normally, this would drop you back to BASIC—but not when On Break Goto is active. Instead, On Break Goto causes a branch to line 280.

Commodore 128 owners should type in Programs 2–5. Make sure you're in 128 mode while typing in these programs. Program 2, Break Maker, creates the 128 version of On Break Goto, ONBREAK/CMD. Programs 3–5 comprise a demo that you can run to see how to use the 128 version of On Break Goto. Type in the programs and save them to disk with the names DEMO (for Program 3), SUB1 (for Program 4), and SUB2 (for Program 5). After typing in the programs, run Break Maker to create ONBREAK/CMD. The 128 version is relocatable, so Break Maker asks for a starting address. Press RETURN to get the default address of 2816. After ONBREAK/CMD has been created, load DEMO and type RUN to see the 128 version of On Break Goto in action.

How It Works

Normally, the 64 and 128 jump through a vector at $328–$329 when the STOP key is pressed. When it's first activated, On Break Goto intercepts this vector and places its own address in these locations. Since the vector now points to On Break Goto, it is called automatically whenever the STOP key is pressed. Using the dynamic keyboard technique, the 64 version of On Break Goto first clears the screen and then prints a GOTO *xxxx*, where *xxxx* is the target line number. The 128 version uses basically the same technique, but you can customize it to perform a variety of BASIC commands.

Customizing the 64 version is easy: Just change LN$ in line 60 to the line you wish to jump to when the STOP key is pressed. You can include On Break Goto in any of your BASIC programs. POKE the data into memory near the beginning of your program and type SYS 49152 to activate On Break Goto. To disable On Break Goto, simply type SYS 49152 again.

To customize the 128 version, change A$ in line 50 to the commands you want executed when the STOP key is pressed. You can execute any commands you like, but you're limited to 95 characters. The last command should clear the screen. Next, change the name of the file in line 110; then run the program to create a new version of On Break Goto. Your BASIC programs can BLOAD this file as necessary. Because the 128 version of On Break Goto is relocatable, you must install the STOP vector yourself. POKE the starting address of On Break Goto into memory locations 808 and 809 in low-byte/high-byte form. The following lines do this for you:

```
10 SA=2816:REM STARTING
   ADDRESS
20 HI=INT(SA/256):LO=SA-(HI
   *256):POKE 808,LO:POKE 809,HI
```

Next, your program needs to disable the RUN/STOP–RESTORE combination. The command POKE 792,98 accomplishes this. When you want to restore everything to normal, execute the following line:

```
POKE 808,110:POKE 809,246:POKE 792,64
```

See program listings on page 68. **G**

ATTENTION PROGRAMMERS!

COMPUTE!'s Gazette is looking for good games, utilities, applications, and educational programs written in BASIC or machine language for the 64 and 128. We pay competitive rates along with handsome royalties based on disk sales.

d'iversions

Fred D'Ignazio

Ever since Nintendo invaded our home a year ago, I've been feeling slightly displaced, like a man who was once a center-stage star and who is now demoted to scraping up bubble gum off the theater floor.

My kids and I used to play games on our home computer—games like Epyx's *The Legend of Blacksilver*, SSI's *Questron II*, EA's *Jordan vs. Bird: One-on-One*, Gamestar's *Take Down*, Arcadia's *Aaargh!*, and, of course, gobs and gobs of good educational games.

Then the Nintendo landed, and things haven't been the same since. The Nintendo runs day and night. (We're not even allowed to shut off the machine when we go to bed because there's always a game in progress—and there's no disk drive to back it up.) Meanwhile, I don't think our little home computer has been fired up in weeks.

America's Kids: Going Ga-Ga

I'll bet there are a few others out there just like me—good, red-blooded computer owners and proud parents—who thought that their computers could satisfy their children's craving for games. But that's not the case any longer. America's kids are going ga-ga over Nintendo videogames. Last year the Japanese toy maker racked up $750 million in sales; this year it's expected to sell as many as 8½-million units (once the back orders are shipped) for over $1.7 billion. The numbers are staggering. More than 33½ million game cartridges have been sold so far; another 12 million are on order.

With Nintendo games in over 17 percent of all American homes and in *over half of all homes with children*, it's no wonder that *Toy and Hobby World* magazine editor Rick Anguilla says, "A boy between 8 and 15 without a Nintendo is like a boy without a baseball glove."

That goes for girls, too. My 12-year-old daughter has told me, flat out, that it's unlikely she'll spend much time at her girlfriend's house if there's no Nintendo handy.

From the Horse's Mouth

What makes Nintendo so popular? Determined to track down the answer, I donned my journalist's cap, picked up a yellow legal pad, and strode fearlessly into the living room—and nearly tripped over my son, Eric, who was lying in the middle of the floor. In his hand was a tiny gray game controller with a black, cross-shaped button.

His fingers moved like lightning across the button, but his body was rigid, his gaze locked onto the tiny musclebound figure bobbing across the TV screen.

On the floor next to Eric, also staring at the screen, were his two best friends and one of his friend's baby sisters.

No one seemed to notice me.

"Ahem." I cleared my throat. "Why is it that America's youth seem so attached to these new Nintendo games?" I hastily scribbled down my question on my notepad. I looked up.

Silence. Eric's hand was a blur. Otherwise no sign of life anywhere in the room.

I tried again. "Do you think it's the high-quality graphics?" I asked, my eyes noting the sequence of colorful graphics screens that appeared on the TV. "Or maybe it's complexity?" I ventured. "You know . . . secret passageways, shortcuts, codes, extra points, dozens of goodies hidden right beneath the surface, waiting to be discovered if you're clever enough."

Suddenly Eric cried out. It was a painful cry, a surprising cry from a person only nine years old. My eyes were riveted on the screen. The figure—was it Rambo or Contra or one of the innumerable Mario Brothers?—was bathed in white light. The hero's image flickered in a strobe effect and went black.

Game Over flashed on the screen in muted, somber white.

"Too bad, Eric," consoled his friends. Then they climbed on top of him trying to wrestle the game paddle out of his hands. In a flash, a new game had begun.

A reincarnated superhero was climbing, hopping, and dropping across a garish, multicolored landscape, dodging midair explosions, relentless mushrooms with army helmets, and pursuit teams of homicidal turtles.

"You know," I continued, desperate to get at least one good quotation from the kids, "my own pet theory is that children like these games because of the *chase*. You're always running somewhere, trying to surmount impossible odds, facing death at every moment. Real life kind of pales by comparison. I mean, how can a Cub Scout meeting or a bike ride around the block compare to rescuing the Mushroom Princess from the horrible clutches of the Koopa turtle king?"

I looked around me, certain that I'd finally gotten through. Surely every kid in the room was in agreement. It was *so* obvious.

"Ah, well," I said, shaking my head. I wandered over to our home computer and sat down. I stroked the keys. (They felt cold to the touch.) Suddenly feeling terribly nostalgic, I searched through our disk box and found a crumpled old disk. I put it in the drive.

Soon I was thoroughly engaged, playing a game of *Choplifter*, totally oblivious to the kids on the floor and the action on the Nintendo screen. In a moment I was feeling better again, more in control. That's when I started humming the theme song from *Super Mario Brothers*. **G**

machine language programming

Binary to Decimal

Jim Butterfield

We've discussed converting decimal numbers input as ASCII characters into binary values that are more convenient for the computer to handle. (See the October 1988 column.) This was a fairly straightforward process; basically, we multiplied each digit in the number by 10. But going the other way—from binary to decimal—is much more involved. Division is a little more complex than multiplication, and the first methods a beginner usually thinks of seem somewhat messy.

With small numbers, a primitive approach is often best. As an example, consider disk track and sector numbers. When these are translated from binary to decimal on Commodores, the result occupies no more than two digits.

Suppose we have a disk track number stored at address $2040 that we need to convert. Here's the procedure:

Step 1. Set the tens counter to 0.
Step 2. If the value is less than 10, go to step 4.
Step 3. Subtract 10 and add 1 to the tens counter; go back to step 2.
Step 4. Print the counter as a tens digit.
Step 5. Print the remainder as the ones digit.

Let's try it. Locate the program beginning at address $2000 (8192 decimal)—an area of memory available on the 64 and 128. First, store a value of decimal 23 ($17) into address $2040. Then enter the following from a monitor:

```
2000  LDA  $2040   ;Step 1
2003  LDX  #$00    ;Step 2
2005  CMP  #$0A
2007  BCC  $200E   ;Step 3
2009  SBC  #$0A
200B  INX
200C  BNE  $2005   ;Step 4
200E  TAY
200F  TXA
2010  ORA  #$30
2012  JSR  $FFD2  ;Step 5
2015  TYA
2016  ORA  #$30
2018  JSR  $FFD2
201B  RTS
```

Return to BASIC, SYS 8192, and the value 23 prints. Not too hard.

But with larger numbers that may require multiple bytes, this method becomes tedious. First, subtract the tens of thousands, then the thousands, then the hundreds, and so on—it loses its elegance.

There's a better way. It uses a special feature of the 6502 family of processors known as *decimal mode*. When a number is considered to be in decimal mode, it's stored as two decimal digits to a byte. The four high bits (or nybble) contain one digit; the four low bits contain the other. The way these numbers are handled is different for only two commands: add (ADC) and subtract (SBC).

Suppose we have a binary number, 00010111 ($17). We would normally say this is one 16 and seven 1s (a decimal 23). But if we decided to consider this number as BCD (binary coded decimal), we would consider exactly the same bits as one 10 and seven 1s, or 17. It looks like 17 in hex (hexadecimal), and its value is 17 in BCD. Considered as a binary number, its decimal value is still 23. But it's how we use the number that counts.

If we add 1 to $09 in the computer's native mode (binary), the result is $0A. But if we do the same thing in decimal mode, it comes out as $10. In binary, this seems like nonsense: 1 plus 9 equals 16? But if we put on our decimal hats and read $10 as 10, not 16, it seems fine.

This is the first problem that hackers run into when they start playing with the TOD (time of day) clock. The time seems to leap ahead erratically. But everything sorts itself out once you understand that the clock runs in BCD, not binary.

Now, let's recode the task above using decimal mode:

```
2000  LDA  $2040
2003  STA  $2041
2006  LDA  #$00
2008  LDX  #$00
200A  SED          ;decimal!
200B  ASL  $2041   ;loop comes back
                   here
200E  STA  $2042
2011  ADC  $2042   ;add to self
2014  INX
2015  CPX  #$08
2017  BNE  $200B   ;clean up and print
2019  CLD          ;back to binary!
201A  TAY
201B  LSR          ;extract high digit
201C  LSR
201D  LSR
201E  LSR
201F  ORA  #$30
2021  JSR  $FFD2
2024  TYA
2025  AND  #$0F    ;get low digit
2027  ORA  #$30
2029  JSR  $FFD2
202C  RTS
```

The code is longer (in this simple example), but it's much more efficient. The method works this way: Get the bits out of the binary number one at a time using the ASL (Arithmetic Shift Left) command; each bit moves into the carry flag. Now, double the BCD number by adding it to itself (in decimal mode); ADC (ADd with Carry) includes the carry bit in the addition. The result, for this small number, is two digits in the A register. We extract and print each, one at a time.

Even big numbers slide easily into decimal using this method. The binary number might be in several bytes. In such a case, we'd slip out the high bit with a "long shift"—ASL of the lowest-order byte and ROL of the other bytes, working up to the high byte. The decimal addition in the results area would be similar, but we'd be adding a multibyte number to itself. The usual method: Start at the low end and work up, with the carry taking care of the linkage between bytes.

Signed numbers require a slight adjustment to the rules. We'd test for the sign and negate the binary number. And as for fractions, well, that's another story. **G**

THE geos column

Todd Crusan

The GEOS deskTop is a powerful application. It's your interface to the entire GEOS family. One feature it's missing, though, is a screen dump. "Screen Dumper" is a machine language screen dump for GEOS in the form of a desk accessory. It works from the deskTop and from most applications that support desk accessories.

Since Screen Dumper uses standard GEOS system calls, it should work with any printer for which you have a printer driver.

Typing It In

Since Screen Dumper is written in machine language, you'll need to type it in with "MLX," the machine language entry program found elsewhere in this issue. (Commodore 128 users must be in 64 mode when typing in the listing.) When MLX prompts you, respond with the following values:

Starting address: 16A5
Ending address: 1790

Type in the data for Program 1, Screen Dumper. When you've finished typing, save copies of the program with the name SCREEN DUMPER to at least two disks. Be sure that one of the disks is a GEOS work disk. One of these files will be modified by Program 2; the other is a backup in case something goes wrong.

Now type in Program 2, "BSD." (Again, 128 users must be in 64 mode.) Use "The Automatic Proofreader" when you enter this program. Save copies of BSD to the disks containing Screen Dumper.

BSD is used to make Screen Dumper into a GEOS desk accessory. It does so by directly writing to your disk's directory. If you've made a mistake in entering BSD, it could destroy the directory of your disk. For this reason, be very careful with BSD until you're sure it works correctly. The first time you run BSD, place it and a copy of Screen Dumper on a disk by themselves. This way, if something goes wrong, you won't lose valuable files.

Run Program 2. It will expect to find the file named SCREEN-DUMPER on the disk in drive 8. If it can't find the file, BSD prints the message FILE NOT FOUND!. If BSD is successful, it prints the message ALL DONE!. The file SCREEN-DUMPER is now a GEOS desk accessory.

To use Screen Dumper, you must be running GEOS. You can get an instant screen dump at any time by double-clicking the Screen Dumper icon or by selecting Screen Dumper from the GEOS menu. For Screen Dumper to work correctly, you must have a copy of your printer driver on the current disk. If the printer driver isn't present, Screen Dumper returns you to the deskTop without printing.

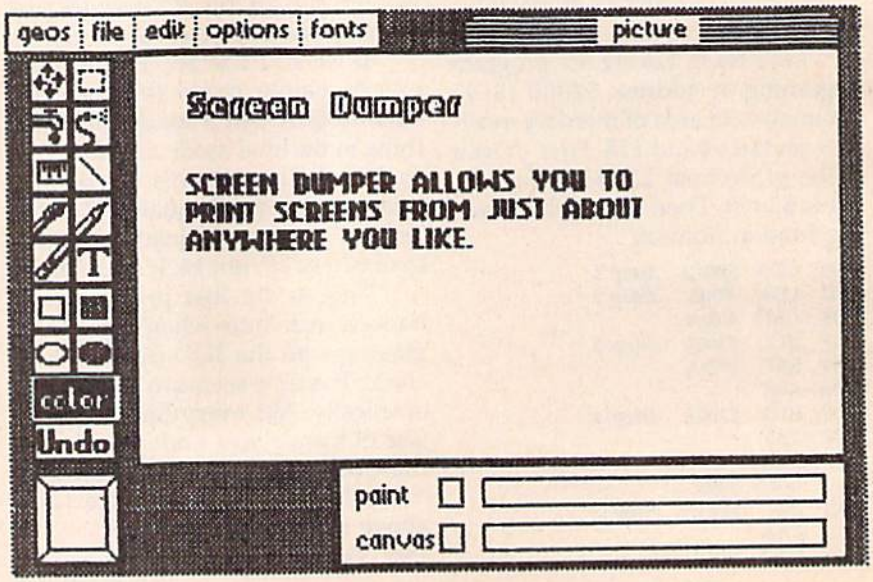
How It Works

Using the *GeoProgrammer* development system, it's easy to print graphics from GEOS. If you're writing a GEOS application, you can print graphics by following this five-step procedure.

First, your application makes a call to the printer-driver routine GetDimensions to discover the page dimensions supported by the printer. GetDimensions returns the line width in the X register and the number of lines in the Y register. The line width and the number of lines per page are in units of Commodore hi-res bitmapped cards (a card is equivalent in size to a character on the 64's text screen). The maximum line width supported by GEOS is 80 cards, but some printers only support 60. A GEOS screen is 40 cards wide by 25 cards high.

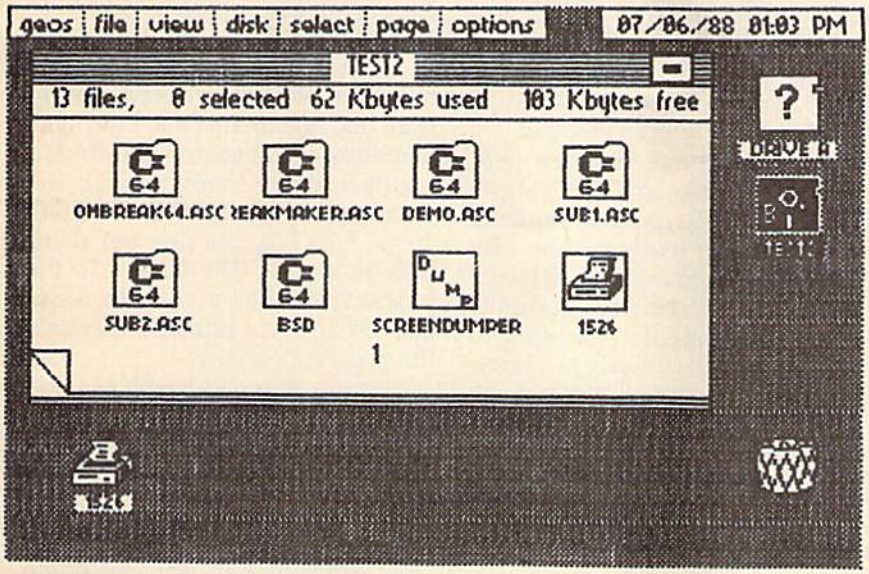
Second, your application must call InitForPrint. This initializes the printer for a printing session. This call should be made only once per printing session. The InitForPrint routine expects no parameters, and it does not return a value.

Third, call StartPrint. This call initializes the printer for printing a page of graphics. This call should be made once per page. The StartPrint routine expects no parame-



Since *Screen Dumper* is installed as a Desk Accessory, it's simple to use.

Just Point and Click.



ters. It returns a success value in the X register. A nonzero value indicates a printer error.

Fourth, your application calls PrintBuffer for each line of graphics on the page. The application must first load a 640-byte buffer (80 cards) with graphics data and pass the address of this buffer in R0 (memory locations 2 and 3). The application must also provide another 640-byte buffer for the printer driver's routines to use as a work area. The address of this work buffer is passed in R1 (memory locations 4 and 5). Applications must take care to pass the same work buffer to PrintBuffer for every line of the page. The PrintBuffer routine does not return a value.

Finally, your application must call StopPrint once per page to terminate printing. This call flushes the printer's buffer and sends a form feed to the printer. Since StopPrint prints the remaining graphics data in the buffer, the application must pass the addresses of the data buffer and the work buffer in R0 and R1 in the same way it passes them for PrintBuffer. The StopPrint routine returns no value.

Printer-Driver Routine Entry Points

InitForPrint	$7900	(jump table + 0)
StartPrint	$7903	(jump table + 3)
PrintBuffer	$7906	(jump table + 6)
StopPrint	$7909	(jump table + 9)
GetDimensions	$790C	(jump table + 12)
PrintASCII	$790F	(jump table + 15)
StartASCII	$7912	(jump table + 18)
SetNLQ	$7915	(jump table + 21)

See program listings on page 73. **G**

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What Is Programming?

Rhett Anderson

Remember when the Commodore PET was a new computer? It's been a long time. Over the years, much has changed. The home computer has begun to show the promise of becoming an appliance that can be used by anyone who is willing to expend a little effort.

As computers (and especially their accompanying software) have become friendlier, fewer people have had to learn how to program. Is that a good thing?

Learn to Program, Now

Computer literacy has seen the light of some strange days. In the early eighties, workers and students were told that they had to learn to program—and quick! The Information Age was upon us, after all.

Lately, some people have come to think of computer literacy as knowing how to use *Lotus 1-2-3*. These people would have you think that no computer experience is good computer experience—unless it takes place on an AT keyboard.

The way computer technology changes, that attitude shouldn't last for long. You don't need to learn *Lotus 1-2-3* any more than you need to program. What's important when getting to know computers is that you get an intuitive grasp on why and how they work. That way you'll be ready for the new developments to come, both in software and in hardware. Even if you've used an unexpanded VIC, your experience may tell you why the bank sent you a check for $0.00. Maybe you'll have some small grasp of how a ballot box works. And hopefully you won't be left in the cold when you see a computer simulation of the greenhouse effect on the nightly news.

Hey, It's Free

You don't *need* to learn how to program. Having said that, though, I believe that a lot of home computer owners miss the boat when they ignore the programming languages available for their computers. If you have a computer at home, why not learn to program? The BASIC programming language is built into Commodore 8-bit machines, so the hobby won't cost you anything but some time and a little electricity.

If you choose to learn programming, what are you getting into? Is computer programming an art or a science? It seems to be a little of both. Programs have to be designed. This design work is similar to the planning of a painting, a piece of music, or the plot of a book. There are engineering-like tasks in programming, too. You'll use a variety of problem-solving techniques as you program.

Talk Like a Computer

When you program, you're crawling into an alien mind. Computers don't make the intuitive leaps that you make when you have a conversation with a friend. You have to spell out exactly what the computer has to do. Even the so-called high-level computer languages are only high level when compared with the only language that a computer really understands—*machine language*. Compared to humans, computers talk at a very low level indeed.

That doesn't mean programming is boring, though. Stepping down to this level of reasoning can be fascinating.

Just how does a machine think? For all you nonprogrammers out there, a quick example will provide a few clues.

```
10 FOR I=1 TO 10
20 PRINT I
30 NEXT I
```

The numbers at the start of the lines (10, 20, and 30) are called *line numbers*. The computer follows these statements in numerical order. The numbers are arbitrary; we could have used 7, 29, and 3200.

If computer programs all moved from start to finish, one line at a time, you'd never have to wait for a program to finish—it would be done in a flash.

The vast majority of programs, however, do *not* proceed simply from one line to the next. They take branches. For instance, the BASIC example above loops through the lines ten times (FOR I=1 TO 10 . . . NEXT I), printing out numbers as it goes. The letter *I* in the program is called a *variable;* it can take on different numeric values as the program executes.

There. You've learned some of the most important concepts in programming.

To Good Use

Knowing these few things about programming can tell you much about how computers work.

Suppose you're working on a spreadsheet. It's getting rather large and many of the numbers depend on values in other cells. Why does it take the computer so long to recalculate the cells? Because it's in a loop like the one in the program above. The more cells you use, the more times the program must go through the loop.

Programming gives you an insight into computer games, too. Ever wondered why adventure games understand only certain words and phrases? Ever wonder why there are never more than seven enemy spaceships in a certain game? Once you try to write a game program, you may find out why.

Computers—in grocery stores, banks, offices, factories, and homes—are here to stay. If you choose to learn their language, you're sure to gain.

bug-swatter

• The BASIC program listed under the heading "Printer: Are You There?" in the January 1989 "Feedback" column has one small error. The subroutine starting at line 900 is supposed to test whether the printer is available for printing without giving a DEVICE NOT PRESENT ERROR. To make the subroutine work correctly, you must remove the secondary address from the OPEN statement in line 900. The corrected line reads

```
900 OPEN4,4:PRINT#4,CHR$(0)
```

• "Smart Disassembler" (January 1989) disassembles forward branches incorrectly. Correct the problem by changing line 660 to the following:

```
660 N=USR(PC+1):IFN>127THENN=
    N-256
665 AD=PC+N+2:A$=STR$(AD):
    IFHTHENGOSUB780
```

• The 128 version of "Digi-Sound" (December 1988) doesn't load samples correctly. When you try to load a sample, you get SYNTAX ERROR IN 170. Change line 170 as follows to correct the problem:

```
170 BLOAD(F$),B0,P9728:BLOAD
    (F$+".2"),B1,P9728:RETURN
```

G

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BEFORE TYPING . . .
Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Planebender

See instructions in article on page 42 before typing in.

```
C000:4C 57 C3 00 A0 07 00 00 17
C008:07 03 02 0C C0 00 00 28 FC
C010:0B 0C 04 06 0A 0D 0E 03 9E
C018:02 0A 0F 10 00 00 0A 0A 1E
C020:1A 1B 0A 1E 1F 0A 0A 11 DE
C028:12 15 16 17 0A 11 13 15 FB
C030:16 17 0A 11 14 15 16 17 0D
C038:2A 22 22 22 22 22 2A 00 AB
C040:28 08 08 08 08 08 2A 00 0E
C048:2A 02 02 2A 20 20 2A 00 18
C050:2A 02 02 0A 02 02 2A 00 B4
C058:22 22 22 2A 02 02 02 00 76
C060:2A 20 20 2A 02 02 2A 00 12
C068:2A 20 20 2A 22 22 2A 00 9B
C070:2A 02 02 02 02 02 02 00 04
C078:2A 22 22 2A 22 22 2A 00 6C
C080:2A 22 22 2A 02 02 2A 00 F2
C088:00 00 00 00 00 00 00 00 0A
C090:00 01 05 00 00 05 01 00 09
C098:40 50 54 40 40 54 50 40 11
C0A0:00 04 14 55 14 04 00 00 AB
C0A8:00 10 14 55 14 10 00 00 E6
C0B0:15 14 15 11 00 00 00 00 75
C0B8:00 00 00 44 54 14 54 00 1A
C0C0:15 15 15 15 15 15 15 00 2D
C0C8:55 F5 75 75 75 FD 55 00 C6
C0D0:55 FD 5D FD D5 FD 55 00 59
C0D8:55 FD 5D 7D 5D FD 55 00 95
C0E0:50 51 55 55 55 51 50 00 6F
C0E8:00 00 F0 FF FF 3F 0F 03 A6
C0F0:00 00 00 00 F0 FC FF FF ED
C0F8:11 00 11 00 11 00 11 00 CF
C100:11 00 11 00 11 00 11 00 D8
C108:15 10 10 10 10 10 15 00 08
C110:55 01 01 01 01 01 55 00 65
C118:14 05 01 04 01 05 14 00 8B
C120:45 14 10 44 10 14 45 00 EC
C128:01 15 01 15 11 11 10 15 E4
C130:00 55 01 51 11 51 01 55 63
C138:0A 29 29 2A 05 00 0A 01 10
C140:80 50 00 A0 A4 A4 94 50 53
C148:08 2A 22 2A 22 22 22 00 1F
C150:22 22 22 22 22 2A 08 00 9D
C158:2A 02 02 0A 08 08 00 08 BA
C160:28 22 22 28 22 22 22 00 25
C168:28 22 22 22 22 22 28 00 D8
C170:20 20 20 20 20 20 2A 00 E7
C178:2A 08 08 08 08 08 08 00 05
C180:2A 20 20 28 20 20 2A 00 7D
C188:00 00 00 00 00 00 06 00 18
C190:00 0C 00 00 98 00 00 F0 CC
C198:00 00 FC 00 00 F0 00 00 7F
C1A0:C0 00 00 00 00 00 00 00 84
C1A8:00 00 00 00 00 00 00 00 2C
C1B0:00 00 00 00 00 00 00 00 34
C1B8:00 00 00 00 00 00 00 00 3C
C1C0:00 00 00 00 00 00 00 00 44
C1C8:0A 28 47 2B A0 B8 00 4F 2E
C1D0:20 2E 00 C0 00 BF 00 AF AA
C1D8:02 BD 20 9F 20 3F 20 AA B3
C1E0:08 AF 08 A7 29 FF 08 EF 19
C1E8:0A ED 0A AD 0A ED 0A 89 AE
C1F0:08 EE 08 AF 08 E6 2B 6A CC
C1F8:3B 68 FF F9 0A E8 6B 3B D9
C200:4C 57 C3 AD CF C1 8D 05 7A
C208:C0 AD CE C1 8D 06 C0 20 75
C210:A5 C2 AD 06 C0 8D 04 C0 34
C218:20 55 C2 18 AD 04 C0 6D 49
C220:CC C1 8D 04 C0 B0 0A C9 15
C228:A0 B0 06 20 55 C2 4C 1B 56
C230:C2 18 AD 06 C0 6D 07 C0 BD
C238:CD CC C1 90 04 38 ED CC C2
C240:C1 8D 06 C0 18 AD 05 C0 19
C248:6D CD C1 8D 05 C0 B0 04 99
C250:C9 B8 90 BB 60 AD CA C1 C7
C258:85 FB AD CB C1 85 FC AE DE
C260:04 C0 E0 04 90 14 18 A5 1F
C268:FB 69 08 85 FB A5 FC 69 79
C270:00 85 FC CA CA CA CA 4C 07
C278:62 C2 8A A8 A9 3F C0 00 87
C280:F0 07 38 6A 6A 88 4C 7E 7A
C288:C2 31 FB 91 FB AD 0E C0 C7
C290:F0 01 60 AD 0C C0 E0 00 DA
C298:F0 06 4A 4A CA 4C 96 C2 7D
C2A0:11 FB 91 FB 60 A9 00 8D D6
C2A8:CA C1 A9 20 8D CB C1 AC 07
C2B0:05 C0 C0 00 D0 01 60 C0 0D
C2B8:08 90 18 18 AD CA C1 69 70
C2C0:40 8D CA C1 AD CB C1 69 C8
C2C8:01 8D CB C1 98 E9 07 A8 EA
C2D0:4C B7 C2 C0 00 D0 01 60 74
C2D8:18 AD CA C1 69 01 8D CA 80
C2E0:C1 AD CB C1 69 00 8D CB 7A
C2E8:C1 88 4C D3 C2 A9 00 85 7A
C2F0:FD A9 20 85 FE A2 00 A9 68
C2F8:00 A0 00 91 FD C8 C0 00 54
C300:D0 F9 E6 FE E8 E0 1E D0 13
C308:F2 60 AD 08 C0 8D DA DB 25
C310:8D DB DB A0 00 99 00 D8 1A
C318:99 FF D8 99 FE D9 99 C0 74
C320:DA C8 C0 00 D0 EF 60 AD 14
C328:09 C0 0A 0A 0A 0A 0D 0A E2
C330:C0 A0 00 99 00 04 99 FF 1D
C338:04 99 FE 05 99 C0 06 C8 FC
C340:C0 00 D0 EF AD 09 C0 8D E1
C348:E0 DB 8D E1 DB AD 0A C0 71
C350:8D E6 DB 8D E7 DB 60 AD C9
C358:0B C0 8D 20 D0 8D 21 D0 19
C360:20 ED C2 AD 11 D0 09 20 A4
C368:8D 11 D0 AD 16 D0 09 10 06
C370:8D 16 D0 AD 18 D0 09 08 57
C378:8D 18 D0 A0 00 B9 88 C1 AA
C380:99 80 03 C8 C0 40 D0 F5 80
C388:A9 01 A0 00 99 C0 07 C8 DF
C390:C0 28 D0 F8 A9 00 8D 07 9B
C398:C0 AD 0B C0 8D DE DB 8D 86
C3A0:E4 DB A9 01 8D D8 DB A9 08
C3A8:32 8D CE C1 8D CF C1 A9 7B
C3B0:7E 8D 00 D0 A9 5B 8D 01 BE
C3B8:D0 A9 20 8D D0 C1 A9 2E FE
C3C0:8D D1 C1 A9 A0 8D CC C1 EC
C3C8:A9 B8 8D CD C1 4C 89 C5 F9
C3D0:A9 00 8D 15 D0 8D CF C1 4E
C3D8:8D CE C1 8D 0F C0 85 00 72
C3E0:AD D0 C1 8D CC C1 AD D1 1F
C3E8:C1 8D CD C1 20 ED C2 20 E8
C3F0:10 C5 A9 0F 8D C9 C1 20 4F
C3F8:03 C2 20 E4 FF C9 9D D0 38
C400:20 AD CC C1 C9 0C F0 F2 0E
C408:20 67 C5 CE CC C1 20 03 D1
C410:C2 AD 07 C0 CD CC C1 D0 49
C418:03 20 8C C4 A2 08 4C F6 CD
C420:C4 C9 1D D0 15 AD CC C1 E9
C428:C9 50 F0 CE 20 67 C5 EE CE
C430:CC C1 20 03 C2 A2 08 4C C1
C438:DC C4 C9 91 D0 15 AD CD B7
C440:C1 C9 0C F0 B5 20 67 C5 70
C448:CE CD C1 20 03 C2 A2 03 52
C450:4C F6 C4 C9 11 D0 15 AD 96
C458:CD C1 C9 5C F0 9C 20 67 D9
C460:C5 EE CD C1 20 03 C2 A2 93
C468:03 4C DC C4 C9 20 D0 2B 0A
C470:20 67 C5 EE 07 C0 20 03 0A
C478:C2 AD 07 C0 CD CC C1 D0 B1
C480:06 20 8C C4 4C FA C3 A2 6B
C488:0D 4C DC C4 A9 00 8D 07 03
C490:C0 8D 1C C0 8D 1D C0 20 EF
C498:10 C5 60 C9 0D D0 3A A9 0E
C4A0:00 8D 10 D0 18 AD CC C1 6F
C4A8:6D 07 C0 C9 73 90 03 EE 32
C4B0:10 D0 0A 18 69 1A 8D 00 08
C4B8:D0 18 AD CD C1 69 29 8D D6
C4C0:01 D0 A9 00 8D CF C1 8D F0
C4C8:CE C1 AD CC C1 8D D0 C1 54
C4D0:AD CD C1 8D D1 C1 4C 8E 72
C4D8:C5 4C FA C3 18 BD 10 C0 8C
C4E0:69 01 C9 0A D0 07 CA FE 70
C4E8:10 C0 E8 A9 00 9D 10 C0 B9
C4F0:20 10 C5 4C FA C3 38 BD 21
C4F8:10 C0 E9 01 C9 FF D0 07 FE
C500:CA DE 10 C0 E8 A9 09 9D 54
C508:10 C0 20 10 C5 4C FA C3 E9
C510:A9 00 85 FB A9 3E 85 FC 2F
C518:A9 00 8D 0F C0 AC 0F C0 B2
C520:BE 10 C0 A9 38 85 FD A9 3F
C528:C0 85 FE E0 00 F0 11 18 61
C530:A5 FD 69 08 85 FD A5 FE 2A
C538:69 00 85 FE CA 4C 2B C5 BC
C540:A0 00 B1 FD 91 FB C8 C0 01
C548:08 D0 F7 EE 0F C0 AD 0F DF
C550:C0 CD C9 C1 D0 01 60 18 68
C558:A5 FB 69 08 85 FB A5 FC C7
C560:69 00 85 FC 4C 1D C5 A9 2D
C568:01 8D 0E C0 20 03 C2 A9 E1
C570:00 8D 0E C0 60 EA EA EA 9C
C578:EA EA EA EA EA EA EA EA 04
C580:EA EA EA EA EA EA EA EA 0C
C588:EA A9 C0 8D 0C C0 A9 01 9C
C590:8D 15 D0 A9 06 8D 27 D0 62
C598:A9 01 8D 15 D0 A9 0E 8D 13
C5A0:F8 07 20 ED C2 20 27 C3 F5
C5A8:20 0A C3 A9 28 8D C9 C1 A6
C5B0:A9 00 20 10 C5 20 9F FF 04
C5B8:20 E4 FF C9 1D D0 31 AD 66
C5C0:00 D0 C9 58 D0 07 AD 10 4D
C5C8:D0 C9 01 F0 E8 EE 00 D0 32
C5D0:EE 00 D0 AD 00 D0 C9 00 9F
C5D8:D0 03 EE 10 D0 18 AD CE 7D
C5E0:C1 69 01 CD CC C1 D0 02 B5
C5E8:A9 00 8D CE C1 4C AC C8 49
C5F0:C9 9D D0 31 AD 00 D0 C9 CE
C5F8:1A D0 07 AD 10 D0 C9 00 D8
C600:F0 B3 CE 00 D0 CE 00 D0 5F
C608:AD 00 D0 C9 FE D0 03 CE 33
C610:10 D0 AD CE C1 C9 00 D0 82
C618:06 AD CC C1 8D CE C1 CE C3
C620:CE C1 4C AC C8 C9 11 D0 3A
C628:36 AD 01 D0 C9 E0 F0 85 A2
C630:EE 01 D0 38 AD CD C1 E9 25
C638:01 CD CF C1 D0 1B A9 00 16
C640:8D CF C1 38 AD CE C1 ED 5E
C648:07 C0 90 04 C9 00 B0 03 8E
C650:6D CC C1 8D CE C1 4C AC 9B
C658:C8 EE CF C1 4C AC C8 C9 8C
C660:91 D0 35 AD 01 D0 C9 29 74
C668:D0 03 4C B5 C5 CE 01 D0 40
C670:AD CF C1 C9 00 D0 1B AD C4
C678:CD C1 8D CF C1 18 AD CE A4
C680:C1 6D 07 C0 CD CC C1 90 EC
C688:03 ED CC C1 8D CE C1 AD A1
C690:CD C1 CE CF C1 4C AC C8 AD
C698:C9 44 D0 10 A0 10 A9 18 E7
C6A0:99 10 C0 C8 A9 19 99 10 98
C6A8:C0 4C D0 C3 C9 85 D0 19 1F
C6B0:A9 C0 8D 0C C0 8D D3 C1 5B
C6B8:AD 0B C0 8D DE DB 8D E4 37
C6C0:DB A9 01 8D D8 DB 4C B5 24
C6C8:C5 C9 86 D0 19 A9 40 8D 07
C6D0:0C C0 8D D3 C1 AD 0B C0 1F
C6D8:8D D8 DB 8D E4 DB A9 01 A2
C6E0:8D DE DB 4C B5 C5 C9 87 0D
C6E8:D0 19 A9 80 8D 0C C0 8D 0E
C6F0:D3 C1 AD 0B C0 8D D8 DB 09
C6F8:8D DE DB A9 01 8D E4 DB FE
C700:4C B5 C5 C9 88 D0 17 A9 D7
C708:00 8D 0C C0 8D D3 C1 AD 75
C710:0B C0 8D D8 DB 8D DE DB 43
C718:8D E4 DB 4C B5 C5 C9 45 85
C720:D0 4E EE D2 C1 A0 13 AD 1B
C728:D2 C1 C9 01 D0 11 A9 1C 15
C730:99 10 C0 C8 A9 1D 99 10 3A
C738:C0 20 10 C5 4C 4E C9 C9 87
C740:02 D0 17 A9 20 99 10 C0 CA
C748:C8 A9 21 99 10 C0 20 10 38
C750:C5 AD 0C C0 8D D3 C1 4C 47
C758:4E C9 A9 1E 99 10 C0 C8 EF
```

```
C760:A9 1F 99 10 C0 20 10 C5 2D
C768:A9 00 8D D2 C1 4C 4E C9 51
C770:C9 0D D0 19 AD 27 D0 29 A8
C778:06 C9 06 D0 08 A9 00 8D BF
C780:27 D0 4C AC C8 A9 06 8D B2
C788:27 D0 4C B5 C5 C9 20 D0 2B
C790:03 4C B5 C8 C9 89 D0 15 23
C798:18 AD 08 C0 69 01 C9 10 9F
C7A0:D0 02 A9 00 8D 08 C0 20 7C
C7A8:0A C3 4C B5 C5 C9 8A D0 4E
C7B0:15 18 AD 09 C0 69 01 C9 8E
C7B8:10 D0 02 A9 00 8D 09 C0 68
C7C0:20 27 C3 4C B5 C5 C9 8B 4B
C7C8:D0 15 18 AD 0A C0 69 01 0B
C7D0:C9 10 D0 02 A9 00 8D 0A F5
C7D8:C0 20 27 C3 4C B5 C5 C9 80
C7E0:8C D0 0A 18 EE 20 D0 EE 36
C7E8:21 D0 4C 4E C9 C9 5F D0 B0
C7F0:06 20 ED C2 4C B5 C5 C9 04
C7F8:43 F0 04 4C 2E C9 00 A0 E4
C800:10 B9 10 C0 C9 1A D0 6C DA
C808:A9 18 99 10 C0 C8 A9 19 3E
C810:99 10 C0 20 10 C5 AD D0 50
C818:C1 8D CC C1 AD D1 C1 8D 69
C820:CD C1 38 AD CE C1 CD CC D0
C828:C1 90 06 ED CC C1 4C 26 8A
C830:C8 8D CE C1 A0 00 38 AD A2
C838:CF C1 CD CD C1 90 07 C8 DF
C840:ED CD C1 4C 3A C8 8D CF 19
C848:C1 A9 00 C0 00 F0 08 18 1D
C850:6D 07 C0 88 4C 4B C8 8D A9
C858:FE C7 38 AD CE C1 ED FE 95
C860:C7 90 04 C9 00 B0 07 18 FF
C868:6D CC C1 4C 61 C8 8D CE F8
C870:C1 4C 4E C9 38 AD 00 D0 A5
C878:4A E9 0C AE 10 D0 E0 01 9C
C880:D0 03 18 69 80 8D CE C1 6E
C888:38 AD 01 D0 E9 29 8D CF AD
C890:C1 A9 1A 99 10 C0 C8 A9 09
C898:1B 99 10 C0 20 10 C5 A9 A2
C8A0:A0 8D CC C1 A9 B8 8D CD B4
C8A8:C1 4C 4E C9 AD 27 D0 29 69
C8B0:06 C9 06 F0 64 20 03 C2 F3
C8B8:AD D2 C1 C9 01 D0 3C 38 A6
C8C0:AD CC C1 ED CE C1 E9 01 C5
C8C8:8D CE C1 20 03 C2 38 AD 50
C8D0:CD C1 ED CF C1 E9 01 8D B9
C8D8:CF C1 20 03 C2 38 AD CC 16
C8E0:C1 ED CE C1 E9 01 8D CE 02
C8E8:C1 20 03 C2 38 AD CD C1 C5
C8F0:ED CF C1 E9 01 8D CF C1 E3
C8F8:4C 48 C9 C9 02 D0 1A EE 0F
C900:CF C1 EE CE C1 A9 80 8D F9
C908:0C C0 20 03 C2 AD D3 C1 3C
C910:8D 0C C0 CE CE C1 CE CF 5D
C918:C1 4C 48 C9 06 DB 12 43 4C
C920:48 FF 08 FF 00 FF 08 FB E4
C928:0A FF 00 FF 0E FB C9 57 0C
C930:D0 40 20 38 C9 4C B5 C5 74
C938:A0 00 A9 00 99 41 3E 99 39
C940:42 3D C8 C0 00 D0 F5 60 F8
C948:AE 71 C9 4C 50 C9 A2 28 A4
C950:A0 FF 88 C0 00 D0 FB CA 57
C958:E0 00 D0 F4 4C B5 C5 40 CA
C960:30 3A 42 45 4E 44 2E 30 47
C968:31 28 0A 00 25 0A 26 0A 87
C970:24 01 C9 53 F0 03 4C CB BC
C978:C9 20 3D CB A2 08 A0 01 D4
C980:20 BA FF 20 38 C9 A2 00 03
C988:A9 05 9D 10 C0 E8 A9 22 06
C990:9D 10 C0 E8 A9 23 9D 10 C2
C998:C0 E8 A9 29 9D 10 C0 20 5D
C9A0:64 CA A9 EB 85 FB A9 1F 9B
C9A8:85 FC A2 00 A0 3E A9 FB DF
C9B0:20 D8 FF A2 00 BD EB 1F A2
C9B8:9D 10 C0 E8 E0 0E D0 F5 9C
C9C0:A9 28 8D C9 C1 20 10 C5 F5
C9C8:4C B5 C5 C9 4C F0 03 4C BD
C9D0:3A CA 20 3D CB A2 08 A0 A5
C9D8:01 20 BA FF 20 38 C9 A2 64
C9E0:00 A9 27 9D 10 C0 E8 A9 9C
C9E8:00 9D 10 C0 E8 A9 22 9D C1
C9F0:10 C0 E8 A9 26 9D 10 C0 FC
C9F8:20 64 CA A9 00 A2 FF A0 D4
CA00:FF 20 D5 FF A2 00 BD EB D4
CA08:1F 9D 10 C0 E8 E0 0E D0 5A
CA10:F5 A9 28 8D C9 C1 20 10 8E
CA18:C5 AD F9 1F 8D CC C1 AD FD
CA20:FA 1F 8D CD C1 AD FB 1F 65
CA28:8D 07 C0 AD FC 1F 8D D0 89
CA30:C1 AD FD 1F 8D D1 C1 4C 47
CA38:FF C7 C9 31 90 19 C9 3A C2
CA40:B0 15 38 E9 31 0A 0A 0A E8
CA48:8D 71 C9 38 A9 41 ED 71 5D
CA50:C9 8D 71 C9 4C B5 C5 C9 87
CA58:50 F0 03 4C B5 C5 20 6E EA
CA60:CB 4C B5 C5 A2 04 A9 0A 84
CA68:9D 10 C0 E8 A0 08 38 B9 C6
CA70:5F C9 E9 30 9D 10 C0 E8 FF
CA78:C8 38 B9 5F C9 E9 30 9D A1
CA80:10 C0 A9 07 8D C9 C1 20 2B
CA88:10 C5 20 E4 FF F0 FB C9 6F
CA90:11 D0 2D A2 06 18 BD 10 CE
CA98:C0 69 01 9D 10 C0 C9 0A 04
CAA0:D0 18 A9 00 9D 10 C0 CA 53
CAA8:18 BD 10 C0 69 01 9D 10 62
CAB0:C0 C9 0A D0 05 A9 00 9D D3
CAB8:10 C0 20 10 C5 4C 8A CA CA
CAC0:C9 91 D0 2A A2 06 38 BD B7
CAC8:10 C0 E9 01 9D 10 C0 C9 5C
CAD0:FF D0 E7 A9 09 9D 10 C0 D1
CAD8:CA 38 BD 10 C0 E9 01 9D E7
CAE0:10 C0 C9 FF D0 D4 A9 09 1E
CAE8:9D 10 C0 4C BA CA C9 0D CF
CAF0:D0 22 A2 05 A0 08 BD 10 CC
CAF8:C0 18 69 30 99 5F C9 E8 EB
CB00:C8 BD 10 C0 18 69 30 99 D9
CB08:5F C9 A9 07 A2 62 A0 C9 11
CB10:20 BD FF 60 C9 52 F0 03 A9
CB18:4C 8A CA A2 05 A0 08 BD 74
CB20:10 C0 18 69 30 99 5F C9 F9
CB28:E8 C8 BD 10 C0 18 69 30 88
CB30:99 5F C9 A9 0A A2 5F A0 7A
CB38:C9 20 BD FF 60 A9 00 20 3E
CB40:90 FF AD CC C1 8D F9 1F F9
CB48:AD CD C1 8D FA 1F AD 07 F1
CB50:C0 8D FB 1F AD D0 C1 8D DE
CB58:FC 1F AD D1 C1 8D FD 1F 68
CB60:A2 00 BD 10 C0 9D EB 1F 75
CB68:E8 E0 0E D0 F5 60 A9 02 02
CB70:85 02 EA EA EA EA EA EA 1B
CB78:EA EA AD 00 DD 29 03 49 D8
CB80:03 A0 06 0A 88 D0 FC 8D 32
CB88:3C 03 AD 18 D0 29 08 F0 62
CB90:09 18 A9 20 6D 3C 03 8D D9
CB98:3C 03 A9 00 20 BD FF A9 E5
CBA0:04 AA A0 FF 20 BA FF 20 05
CBA8:C0 FF A2 04 20 C9 FF B0 0E
CBB0:03 4C B7 CB 4C 9A CC A9 A0
CBB8:08 20 D2 FF A9 0D 20 D2 4B
CBC0:FF A2 00 A9 01 8D 40 CD 28
CBC8:A9 00 8D 41 CD A9 00 8D 9D
CBD0:42 CD A9 C7 8D 43 CD 20 E3
CBD8:E1 FF D0 03 4C 9A CC 8A 9C
CBE0:48 98 48 20 A3 CC 68 A8 97
CBE8:68 AA AD 47 CD 2D 45 CD 05
CBF0:F0 0C AD 44 CD 0D 40 CD EE
CBF8:8D 44 CD 4C 09 CC AD 40 FD
CC00:CD 49 FF 2D 44 CD 8D 44 5E
CC08:CD 0E 40 CD AD 40 CD C9 C4
CC10:80 F0 14 18 AD 41 CD 69 A1
CC18:01 8D 41 CD AD 42 CD 69 16
CC20:00 8D 42 CD 4C D7 CB AD 49
CC28:44 CD 09 80 E0 2D 90 0A 67
CC30:AD 44 CD 29 1F 09 80 8D A9
CC38:44 CD 8E 49 CD A6 02 8E 69
CC40:48 CD A8 20 D2 FF 98 CE 1F
CC48:48 CD D0 F6 AE 49 CD A9 E2
CC50:01 8D 40 CD A9 00 8D 44 5F
CC58:CD 38 AD 41 CD E9 06 8D 60
CC60:41 CD AD 42 CD E9 00 8D 8B
CC68:42 CD CE 43 CD AD 43 CD 1E
CC70:C9 FF F0 03 4C D7 CB E0 77
CC78:2D B0 1F 18 AD 41 CD 69 B1
CC80:07 8D 41 CD AD 42 CD 69 81
CC88:00 8D 42 CD E8 A9 C7 8D B5
CC90:43 CD A9 0D 20 D2 FF 4C DD
CC98:D7 CB A9 0D 20 D2 FF 20 83
CCA0:E7 FF 60 AD 43 CD 29 07 BF
CCA8:8D 46 CD AD 43 CD 4A 4A 5F
CCB0:4A A8 B9 0C CD 85 FB B9 C7
CCB8:26 CD 85 FC 18 A5 FB 6D 16
CCC0:46 CD 85 FB A5 FC 69 00 55
CCC8:85 FC 18 AD 3C 03 65 FC F7
CCD0:85 FC AD 41 CD 29 07 49 A0
CCD8:07 A8 C8 A9 00 38 2A 88 91
CCE0:D0 FC 8D 45 CD 18 AD 42 94
CCE8:CD 65 FC 85 FC AD 41 CD A9
CCF0:29 F8 A8 8A 48 78 A2 34 B8
CCF8:86 01 B1 FB A2 37 86 01 0C
CD00:58 A8 68 AA 98 2D 45 CD 7B
CD08:8D 47 CD 60 00 40 80 C0 BE
CD10:00 40 80 C0 00 40 80 C0 9A
CD18:00 40 80 C0 00 40 80 C0 A2
CD20:00 40 80 C0 00 40 00 01 E9
CD28:02 03 05 06 07 08 0A 0B FD
CD30:0C 0D 0F 10 11 12 14 15 06
CD38:16 17 19 1A 1B 1C 1E 1F 0E
CD40:00 FB 00 A5 FB 00 00 00 15
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

MultiView

Article on page 48.

Program 1: MultiView

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
KX 20 IFML=.THENML=1:LOAD"MULT
      IVIEW.ML",8,1
QA 30 POKE52,68:POKE56,68:CLR
MA 40 DIMNA$(12),S(12),P$(12),
      Q$(12),L(12)
RR 50 FORI=1TO10:READNA$(I),S(
      I),L(I):NEXT:FORI=1TO12:
      P$="":Q$="":NEXT
FQ 60 FORI=1TO10:NA$(I)=" "+NA
      $(I)+" {WHT}":NEXT:NA$(1
      1)=" LORES PICTURES
      {WHT}"
SR 70 NA$(12)=" MAIN MENU
      {WHT}":F=49717:LA=49720:
      RV$=CHR$(18)+"{YEL}":H$=
      "{HOME}{5 DOWN}"
ED 80 PRINT"{CLR}";:GOSUB690:P
      RINT"{3 SPACES}COPYRIGHT
       1989 COMPUTE! PUB., INC
      ."
QE 90 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED"
BG 100 PRINT"{4 DOWN}"SPC(15)"
      {CYN}MULTIVIEW":PRINTSP
      C(15)"§3§§10 T§"
HX 110 PRINT"{4 DOWN}{RIGHT}
      {YEL}1){2 SPACES}{GRN}L
      OAD & VIEW PICTURE":PRI
      NT"{DOWN}{RIGHT}{YEL}2)
      {2 SPACES}{GRN}DIRECTOR
      Y"
BK 120 PRINT"{DOWN}{RIGHT}
      {YEL}3){2 SPACES}{GRN}Q
      UIT"
GM 140 SYS49302:E=PEEK(2):IFE<
      49ORE>51THEN140
KJ 150 ONE-48GOTO320,210,160
HA 160 PRINT"{CLR}{WHT}
      {5 DOWN}"SPC(10)"{WHT}A
      RE YOU SURE?{2 SPACES}(
      Y/N)"
```

```
SD 170 GETA$:IFA$="Y"THENEND
AA 180 IFA$="N"THEN80
SB 190 GOTO170
MB 200 END
SC 210 PRINT"{CLR}{5 DOWN}
       {WHT}"SPC(7)"INSERT DIS
       K, PRESS <RETURN>"
HE 220 PRINT"{DOWN}"SPC(6)"SHI
       FT PAUSES, 'C=' KEY TO
       {SPACE}END"
QK 230 GETA$:IFA$=CHR$(13)THEN
       260
JP 240 IFA$=""THEN230
CF 250 GOTO80
FS 260 GOSUB680:IFSS=0THEN280
HA 270 PRINT"{CLR}{3 DOWN}"SPC
       (10)"DISK DRIVE IS NOT
       {SPACE}ON":FORB=1TO2500
       :NEXT:GOTO80
KH 280 SYS49323
JP 290 FORB=1TO2000:NEXT:PRINT
       "{DOWN}"SPC(7)"{7}PRESS
        ANY KEY FOR MAIN MENU"
HB 300 GETA$:IFA$=""THEN300
XK 310 GOTO80
HX 320 GOSUB690:P$(A-6ANDA<>0)
       ="":PRINT"{CLR}{3 DOWN}
       "SPC(9)"{7}WHICH PICTUR
       E FORMAT?{WHT}{2 DOWN}"
RR 330 A=7:P$(1)=RV$
FB 340 FORB=1TO12:PRINT"
       {3 RIGHT}"P$(B)NA$(B):N
       EXT
GH 350 PRINT"{2 DOWN}CURSOR UP
       /DOWN CHOOSES, <RETURN>
        SELECTS"
CG 360 GETA$:IFA$=""THEN360
BM 370 IFA$<>"{DOWN}"ANDA$<>"
       {UP}"THEN400
XG 380 P$(A-6)="":GOSUB660:A=A
       -(A$="{DOWN}")+(A$="
       {UP}")
DS 390 A=A+12*(A>18)-12*(A<7):
       P$(A-6)=RV$:GOSUB660:GO
       TO360
BD 400 IFA$=CHR$(13)THENC=A-6:
       GOTO420
JS 410 GOTO360
JF 420 IFC=12THEN80
SP 430 F$="":INPUT"{CLR}
       {2 DOWN}{3 RIGHT}FILENA
       ME";F$
MD 440 IFF$=""ORLEN(F$)>16THEN
       320
FK 450 PRINT"{3 DOWN}{WHT}"SPC
       (7)"INSERT DISK, PRESS
       {SPACE}<RETURN>"
GB 460 GETA$:IFA$=CHR$(13)THEN
       490
DX 470 IFA$=""THEN460
KB 480 GOTO320
RH 490 GOSUB680:IFSS=0THEN500
PA 495 PRINT"{CLR}{3 DOWN}"SPC
       (10)"DISK DRIVE IS NOT
       {SPACE}ON":FORB=1TO2500
       :NEXT:GOTO320
MS 500 IFC=11THENF$=F$+",S,R":
       GOTO570
QS 510 PRINT"{2 DOWN}'F1' CHAN
       GES BACKGROUND, ANY OTH
       ER QUITS"
SP 520 POKELA,L(C):SYS49152,F$
       ,8
CA 530 OPEN15,8,15:INPUT#15,E:
       CLOSE15:IFE=.THEN550
FQ 540 PRINT"{CLR}{3 DOWN}
       {3 RIGHT}DISK ERROR"E"H
       AS OCCURRED":FORB=1TO25
       00:NEXT:GOTO320
GX 550 IFC=4ORC=5THENGOSUB620
CK 560 PRINT"{CLR}":SYSS(C):GO
       TO80
HS 570 PRINT"{CLR}";:OPEN8,8,2
       ,F$:OPEN15,8,15:INPUT#1
       5,E
JG 580 IFETHENCLOSE15:CLOSE8:G
       OTO610
CH 590 GET#8,A$:PRINTA$;:IFST=
       0THEN590
KS 600 PRINT"{HOME}":CLOSE15:C
       LOSE8:SYS49261:GOTO80
BF 610 PRINT"{CLR}{2 DOWN}
       {3 RIGHT}DISK ERROR"E"H
       AS OCCURRED":FORB=1TO25
       00:NEXT:GOTO320
QF 620 D(1)=1:INPUT"{CLR}
       {2 DOWN}{3 RIGHT}FOREGR
       OUND COLOR{2 SPACES}(0-
       15)";D(1):IFD(1)<0ORD(1
       )>15THEN320
EM 630 D(2)=.:INPUT"{CLR}
       {2 DOWN}{3 RIGHT}BACKGR
       OUND COLOR{2 SPACES}(0-
       15)";D(2):IFD(2)<0ORD(2
       )>15THEN320
KS 640 D(3)=D(2)+(16*D(1)):POK
       EF,D(3):RETURN
PS 650 END
DX 660 PRINTH$:IFA=7THENPRINT"
       {3 RIGHT}"P$(1)NA$(1):R
       ETURN
JB 670 FORB=1TOA-7:PRINT:NEXT:
       PRINT"{3 RIGHT}"P$(B)NA
       $(B):RETURN
MQ 680 OPEN15,8,15:CLOSE15:SS=
       ST:RETURN
RE 690 POKE53280,.:POKE53281,.
       :RETURN
RP 700 DATADOODLE,49433,92,KOA
       LA,49444,96,CREATE WITH
        GARFIELD,49485,96
FC 710 DATAPRINT SHOP,49493,96
       ,PAINT NOW!,49493,96,AR
       T STUDIO,49521,96
RR 720 DATAADVANCED ART STUDIO
       ,49533,96,RAINBOW PAINT
       ER,49580,92
ES 730 DATAPAINTBRUSH,49594,88
       ,BLAZING PADDLES,49655,
       96
```

Program 2: MultiView.ML

See instructions in article on page 48 before typing in.

```
C000:20 FD AE 20 D4 E1 A2 00 5C
C008:AC 38 C2 A9 00 20 D5 FF 0D
C010:60 A2 00 BD 40 7F 9D 00 81
C018:44 BD 40 80 9D 00 45 BD 70
C020:40 81 9D 00 46 BD 40 82 02
C028:9D 00 47 E8 D0 E5 60 A2 71
C030:00 BD 00 5C 9D 00 44 BD 1A
C038:00 5D 9D 00 45 BD 00 5E 44
C040:9D 00 46 BD 00 5F 9D 00 ED
C048:47 E8 D0 E5 60 A9 1D 8D 91
C050:18 D0 4C 5F C0 A9 D8 8D 7D
C058:16 D0 A9 18 8D 18 D0 A9 E7
C060:3B 8D 11 D0 CE 00 DD AD F1
C068:34 C2 8D 21 D0 A9 40 85 AB
C070:CB A5 CB C9 40 F0 FA C9 DC
C078:04 D0 06 EE 21 D0 4C 6D 32
C080:C0 A9 1B 8D 11 D0 A9 C8 F0
C088:8D 16 D0 A9 15 8D 18 D0 EA
C090:A9 C7 8D 00 DD 60 EE 20 F8
C098:D0 20 E4 FF D0 0A A2 00 1B
C0A0:E8 E0 69 F0 F1 4C A0 C0 CD
C0A8:85 02 60 A9 93 20 D2 FF D6
C0B0:A9 08 AA A0 00 20 BA FF 5E
C0B8:A9 01 A2 36 A0 C2 20 BD 15
C0C0:FF 20 C0 FF A2 08 20 C6 9E
C0C8:FF 20 E4 FF 20 E4 FF 20 A3
C0D0:E1 FF F0 3C 20 E4 FF 20 D9
C0D8:E4 FF A5 90 D0 32 AD 8D C2
C0E0:02 C9 02 F0 2B C9 01 F0 98
C0E8:F5 20 E4 FF 8D 37 C2 20 F8
C0F0:E4 FF AE 37 C2 20 CD BD 1E
C0F8:A9 20 20 D2 FF 20 E4 FF D2
C100:F0 06 20 D2 FF 4C FD C0 9C
C108:A9 0D 20 D2 FF 4C CF C0 66
C110:20 CC FF A9 08 20 C3 FF B9
C118:60 A9 00 8D 34 C2 20 2F 2B
C120:C0 4C 4D C0 AD 10 87 8D 17
C128:34 C2 20 11 C0 A2 00 BD D9
C130:28 83 9D 00 D8 BD 28 84 EE
C138:9D 00 D9 BD 28 85 9D 00 34
C140:DA BD 28 86 9D 00 DB E8 9B
C148:D0 E5 4C 55 C0 A9 01 8D C8
C150:34 C2 4C 2A C1 A9 00 8D 0D
C158:34 C2 A2 00 AD 35 C2 9D 60
C160:00 44 9D 00 45 9D 00 46 8F
C168:9D 00 47 E8 D0 F1 4C 4D 66
C170:C0 AD 38 82 8D 34 C2 20 D1
C178:11 C0 4C 4D C0 AD 28 83 A3
C180:8D 20 D0 AD 29 83 8D 34 6E
C188:C2 20 11 C0 A2 00 BD 38 6C
C190:83 9D 00 D8 BD 38 84 9D 40
C198:00 D9 BD 38 85 9D 00 DA 4B
C1A0:BD 38 86 9D 00 DB E8 D0 CD
C1A8:E5 4C 55 C0 A9 00 8D 34 85
C1B0:C2 20 11 C0 20 2F C0 4C 57
C1B8:55 C0 A9 00 8D 34 C2 A2 B1
C1C0:00 BD 00 58 9D 00 44 BD 6C
C1C8:00 59 9D 00 45 BD 00 5A D1
C1D0:9D 00 46 BD 00 5B 9D 00 70
C1D8:47 BD 00 5C 9D 00 D8 BD 91
C1E0:00 5D 9D 00 D9 BD 00 5E 93
C1E8:9D 00 DA BD 00 5F 9D 00 2B
C1F0:DB E8 D0 CD 4C 55 C0 A9 76
C1F8:00 8D 34 C2 A2 00 BD 00 23
C200:80 9D 00 44 BD 00 81 9D FF
C208:00 45 BD 00 82 9D 00 46 67
C210:BD 00 83 9D 00 47 BD 00 57
C218:84 9D 00 D8 BD 00 85 9D 6B
C220:00 D9 BD 00 86 9D 00 DA 59
C228:BD 00 87 9D 00 DB E8 D0 69
C230:CD 4C 55 C0 01 00 24 00 B6
C238:60 00 00 00 00 00 00 00 ED
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Power BASIC:

On Break Goto

Article on page 59.

Program 1: On Break Goto—64 Version

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
AX 20 PRINTCHR$(147);TAB(11)"C
      OPYRIGHT 1989"
BD 30 PRINTTAB(6)"COMPUTE! PUB
      LICATIONS, INC."
SP 40 PRINTTAB(9)"ALL RIGHTS R
      ESERVED{3 DOWN}":CK=0
XM 50 FORI=49152TO49270:READA:
      CK=CK+A:POKEI,A:NEXT
EC 60 IF CK <> 12952 THEN PRIN
      T"ERROR IN DATA STATEMEN
      TS.":END
CB 70 I=I-1:LN$="280":REM ON B
      REAK LINE
HG 80 FOR A=1 TO LEN(LN$):POKE
       I+A,ASC(MID$(LN$,A,1)):
      NEXT
CG 90 POKE I+A,13:POKE I+A+1,1
      9:POKE I+A+2,0:SYS 49152
```

```
PJ 100 PRINTTAB(10);"ON BREAK
       {SPACE}ACTIVATED."
RX 110 PRINT"PRESS THE STOP KE
       Y TO JUMP TO LINE "LN$
CJ 120 GOTO120
ME 130 DATA 173,40,3,201,49,20
       8,20,173
BD 140 DATA 41,3,201,192,208,1
       3,173,103
QD 150 DATA 192,141,40,3,173,1
       04,192,141
FH 160 DATA 41,3,96,173,40,3,1
       41,103
DS 170 DATA 192,173,41,3,141,1
       04,192,169
MR 180 DATA 49,141,40,3,169,19
       2,141,41
FX 190 DATA 3,165,145,201,127,
       208,47,169
CM 200 DATA 147,32,210,255,169
       ,105,133,251
SP 210 DATA 169,192,133,252,16
       0,0,177,251
AM 220 DATA 240,6,153,0,4,200,
       208,246
QS 230 DATA 169,17,32,210,255,
       169,2,133
DA 240 DATA 198,169,19,141,119
       ,2,169,13
EX 250 DATA 141,120,2,169,0,16
       8,96,0
XX 260 DATA 0,16,18,9,14,20,34
       ,211
AF 270 DATA 34,58,7,15,20,15,3
       2
XP 280 REM
DR 290 REM YOUR CODE GOES HERE
       ...
JP 300 REM
QX 310 PRINT"NOW AT LINE "LN$:
       SYS 49152
XK 320 END
```

Program 2: Break Maker—128 Version

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
PJ 20 BANK15:PRINT"{CLR}
      {12 SPACES}COPYRIGHT 198
      9":PRINT"{7 SPACES}COMPU
      TE! PUBLICATIONS, INC.":
      PRINT"{10 SPACES}ALL RIG
      HTS RESERVED"
CR 30 PRINT"{2 DOWN} PLEASE MA
      KE CERTAIN THAT YOU HAVE
      {7 SPACES}INCLUDED YOUR
      {SPACE}MESSAGE AS A$ IN
      {SPACE}LINE 50":PRINT:PR
      INT
AJ 40 AD=2816:PRINT" STARTING
      {SPACE}ADDRESS (DECIMAL)
       ";AD
FC 50 PRINT"{UP}";TAB(27):INPU
      T AD
SR 60 A$="RUN"+CHR$(34)+"SUB1"
      +CHR$(34)
RM 70 IFLEN(A$)>95THENPRINT"ST
      RING TOO LONG ERROR: BRA
      NCH OVERFLOW.":STOP
SA 80 FORX=ADTOAD+24:READA:POK
      EX,A:Y=Y+A:NEXT:IFY<>297
      2THENPRINT"{DOWN}ERROR I
      N DATA STATEMENTS.":STOP
EQ 90 FORX=1TOLEN(A$):A=ASC(MI
      D$(A$,X,1)):POKEAD+24+X,
      A:NEXT
RH 100 FORX=AD+25+LEN(A$)TOAD+
       25+LEN(A$)+16:READA:POK
       EX,A:NEXT
DR 110 POKEAD+10,30+LEN(A$)
XR 120 PRINTCHR$(147):PRINT:PR
       INT:PRINT"BSAVE"CHR$(34
       )"ONBREAK/CMD"CHR$(34)"
       ,B15,P"AD" TO P"AD+42+L
       EN(A$);CHR$(19)
PA 130 POKE208,1:POKE842,13:EN
       D
DS 140 DATA 169,0,141,0,255,16
       5,145,201,127,208,39,17
       3,17,208,41,239,141,17,
       208,32,23,250,147,13,13
GK 150 DATA19,0,169,1,133,208,
       169,13,141,74,3,104,104
       ,76,3,64,96
```

Program 3: Demo—128 Version

```
JF 0 PRINTCHR$(147)"THIS IS A
     {SPACE}DEMO PROGRAM.
     {2 SPACES}IT LOADS
     {7 SPACES}ONBREAK AND SET
     S UP POINTERS FOR IT."
EC 5 BANK 15:BLOAD"ONBREAK/CMD
     ":POKE 808,0:POKE809,11:P
     OKE 792,98
EM 10 PRINT"PRESS RETURN TO CO
      NTINUE.":GETKEYA$
MS 15 RUN"SUB1"
```

Program 4: Demo Sub 1—128 Version

```
AB 0 PRINTCHR$(147);:SLOW
QG 5 PRINT"THIS IS SUB PROGRAM
      1"
MD 10 PRINT"{DOWN}PRESS RETURN
       TO EXECUTE SUB PROGRAM
      {SPACE}2."
PF 15 GETKEY A$
ES 20 RUN"SUB2"
```

Program 5: Demo Sub 2—128 Version

```
MB 0 PRINTCHR$(147)"THIS IS SU
     B PROGRAM 2"
JP 5 PRINT"{DOWN}PRESS <RUN ST
     OP> KEY TO RETURN TO SUB
     {3 SPACES}PROGRAM 1."
JA 10 GOTO 10
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Bacteria

Article on page 40.

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
RP 20 PRINT"{CLR}{2 DOWN}";TAB
      (11);"COPYRIGHT 1989":PR
      INTTAB(5);"COMPUTE! PUBL
      ICATIONS, INC.":PRINTTAB
      (9);"ALL RIGHTS RESERVED
      "
HR 30 PRINTTAB(8);"{2 DOWN}LOA
      DING SPRITE DATA...":PRI
      NTTAB(12);"{DOWN}PLEASE
      {SPACE}WAIT"
AM 40 COLOR4,1:COLOR0,1:FORT=3
      584TO4095:READW$:POKET,D
      EC(W$):NEXT
HG 50 FORT=512 TO5905:READW$:P
      OKET,DEC(W$):NEXT:POKEDE
      C("1448"),0:GOSUB310:DIM
      AN(258)
FH 60 GRAPHIC0,1:COLOR0,1:COLO
      R4,1:GOSUB290
KK 70 GOSUB360:GOSUB230:GOSUB2
      00:POKE53269,0
CS 90 RD=1:YL=1:HM=4:MM=1:MOVS
      PR1,184,218:SPRITE1,1,8:
      SPRITE3,1,2:SLOW:POKEPS,
      0:POKE53269,5:MOVSPR3,0#
      0:SYSIT
QR 100 POKEAB,1:POKECF,1:YU=1:
       POKEAG,0:POKEFB,0:POKEL
       L,1:COLOR3,1:BOX3,7,191
       ,36,199,,1
GP 110 COLOR1,15:HS$=STR$(HS):
       CHAR1,37-LEN(HS$),24,HS
       $+" ",1:GOSUB220
EB 120 IFPEEK(FB)THENSOUND1,Q1
       ,5,1,300,800,0:MOVSPR2,
       AN(PEEK(AG))#10:SPRITE2
       ,1,8
XS 130 SC=V1*YL*(V2*PEEK(P1)+P
       EEK(P2))+V3*RD*(V2*PEEK
       (P3)+PEEK(P4)):SC$=STR$
       (SC)+" ":CS=LEN(SC$):CO
       LOR1,8:CHAR1,9-CS,24,SC
       $,1
FC 140 IFSC<>SETHENSOUND1,800,
       20,0,300,30,3,50:COLOR0
       ,8:FORT=1TO9:NEXT:COLOR
       0,1:SE=SC
FX 150 TY=TY+1:COLOR3,1:DRAW3,
       156,TY+7TO159,TY+7:POKE
       P6,INT(RND(1)*2):IFTY>1
       92THEN240
EE 160 TP=PEEK(P7):IFTP>0THENL
       P=LP+1:POKEP7,0:COLOR1,
       1:CHAR1,0,LP," ",1:SOUN
       D2,P7,1:IFLP=24THENLP=0
       :GOTO260
CP 170 FORT=4TOHM:IFPEEK(P5+T)
       THENMOVSPRT,X,Y:MOVSPRT
       ,INT(RND(1)*V6)#4:POKEP
       5+T,0:SPRITET,1:NEXT:EL
       SENEXT
QD 180 FORXX=4TOHM:MOVSPRXX,IN
       T(RND(1)*V6)#1:NEXT
SS 190 GOTO120
CF 200 POKE53269,5:FORT=4TOHM:
       POKEP5+T,1:NEXT:COLOR2,
       3:BOX2,156,8,159,200,,1
MF 220 SOUND1,10000,1:COLOR1,1
       3:CHAR1,1,2,"LEVEL"+STR
       $(YL)+" ",1:CHAR1,31,2,
       "ROUND"+STR$(RD)+" ",1:
       RETURN
KM 230 POKEAB,YU:POKECF,YU+1:C
       OLOR2,7:BOX2,0,8,3,198,
       ,1:RETURN
SX 240 TY=0:HM=HM+1:IFHM=9THEN
       SOUND2,40000,5:HM=4:MM=
       MM+1:POKE53269,5:POKELL
       ,MM:LP=0:YU=YU+1+(YU=25
       4):YL=YL+1:GOSUB230
JB 250 RD=RD+1+(RD=5)*5:GOSUB2
       00:GOTO120
SE 260 POKEPS,1:POKE53269,0:GR
       APHIC0,1:SYSII,0,11,8:P
       RINT"{WHT}YOU FAILED TH
       E MISSION"
ED 270 SYSII,0,13,12:PRINT"
       {YEL}PRESS ANY KEY":SYS
       II,0,15,9:PRINT"{1}
       {3 SPACES}FOR A NEW GAM
       E{2 SPACES}":IFSC>HSTHE
       NHS=SC
GJ 280 GETKEYY$:GOSUB310:GRAPH
```

```
      IC3:HM=4:GOSUB200:GOSUB
      230:GOTO90
PM 290 FAST:T1=-1:T2=1:X2=3:Y2
      =1:FORT=0TO2*↑STEP↑/128
      :X1=174+INT(1↑0*SIN(T))
      :Y1=140+INT(78*COS(T)):
      MOVSPR1,X1,Y1:A=360-(18
      0/↑)*T
GC 300 T1=T1+1:POKEP,PEEK(4566
      ):POKEP+1,PEEK(4567):PO
      KEP+2,PEEK(4582)AND1:P=
      P+3:AN(T1)=A:NEXT:RETUR
      N
MA 310 CF=5839:C(1)=7:C(2)=5:C
      (3)=3:F1=25:F2=256:F3=4
      894:F4=F3+1:F5=4469:FB=
      251
FX 320 AB=5806:AG=4864:II=4917
      6:IT=5120:LL=5192:P=614
      4:PI=180/↑:X=165:Y=125
SX 330 TC(0)=7:TC(1)=4:TY=0:TM
      =0:V1=100:V2=256:V3=10:
      V4=11:V5=30:V6=360
QK 340 P1=4895:P2=P1-1:P3=P1+2
      :P4=P3-1:P5=4875:P6=491
      2:P7=4898:PS=4904:Q1=81
      86:QC=1.4:QD=5
CD 350 BL$="":FORT=1TO36:BL$=B
      L$+" ":NEXT:RETURN

JM 360 FAST:COLOR4,1:COLOR0,1:
      GRAPHIC3,1:SYSDEC("16DF
      "):CIRCLE0,80,100,70,99
      :PAINT0,80,100
HK 370 SLOW:FORT=0TO2:T1=T+1:C
      OLORT1,C(T1):CIRCLET1,8
      0,100,58+T*4,84+T*4:NEX
      T:CIRCLE3,80,100,69,98
GX 380 FORT=0TO2:PAINTT+1,139+
      T*4,100,1:NEXT:COLOR1,2
MF 390 SLOW:FORT=0TO14:C1=-(C1
      =0):COLOR1,TC(C1):CIRCL
      E1,80,100,58,T*6,,,,22:
      CIRCLE1,80,100,T*4,84,,
      ,,23:NEXT:COLOR1,7:CIRC
      LE1,80,100,58,84:SLOW
AD 400 COLOR1,7:CHAR1,0,0,"HEA
      LTH ":COLOR1,11:CHAR1,3
      5,0,"CLOCK":SLOW
HM 410 COLOR1,7:CHAR1,32,22,"
      {SPACE}BEST ":CHAR1,32,
      23," SCORE":COLOR1,8:CH
      AR1,2,22," YOUR ":CHAR1
      ,2,23," SCORE":COLOR4,1
      :COLOR1,3:CHAR1,15,24,"
       BACTERIA ",1:RETURN
RB 430 DATA 00,00,00,00,00,00,
      00,00,00,00,00,00,00,00
      ,00,00,00,00,00,3C,00,0
      0
ME 440 DATA 7E,00,01,FF,80,01,
      FF,80,03,FF,C0,01,FF,80
      ,01,FF,80,00,7E,00,00,3
      C
HJ 450 DATA 00,00,00,00,00,00,
      00,00,00,00,00,00,00,00
      ,00,00,00,00,00,00,00,0
      0
DK 460 DATA 00,00,00,00,00,00,
      00,00,00,00,00,00,00,00
      ,00,00,00,00,00,00,00,0
      0
DP 470 DATA 00,3C,00,00,7E,00,
      00,7E,00,00,3C,00,00,00
      ,00,00,00,00,00,00,00,0
      0
PG 480 DATA 00,00,00,00,00,00,
      00,00,00,00,00,00,00,00
      ,00,00,00,00,00,00,00,0
      0
HB 490 DATA 00,00,00,00,00,00,
      00,00,00,10,00,00,08,00
      ,01,08,00,02,6E,00,02,F
      F
DF 500 DATA 00,01,BB,80,00,6E,
      40,01,FF,20,02,DD,00,04
      ,5E,00,02,04,00,00,02,0
      0
GE 510 DATA 00,01,00,00,00,00,
      00,00,00,00,00,00,00,00
      ,00,00,00,00,00,00,00,0
      0
RP 520 DATA 00,00,00,00,00,00,
      00,00,00,00,04,00,00,18
      ,00,00,20,00,00,6E,00,0
      0
JE 530 DATA FF,80,04,FE,40,02,
      3F,20,01,FF,10,00,76,00
      ,00,04,00,00,08,00,00,1
      0
SF 540 DATA 00,00,00,00,00,00,
      00,00,00,00,00,00,00,00
      ,00,00,00,00,00,00,00,0
      0
CF 550 DATA 00,00,00,00,00,00,
      00,00,00,00,00,70,00,00
      ,08,00,00,6E,40,00,FF,4
      0
HF 560 DATA 00,3E,40,01,F3,80,
      02,FF,00,02,36,00,03,11
      ,00,00,0F,00,00,00,00,0
      0
CA 570 DATA 00,00,00,00,00,00,
      00,00,00,00,00,00,00,00
      ,00,00,00,00,00,00,00,0
      0
GB 580 DATA 00,00,00,00,00,00,
      00,00,00,22,00,00,41,00
      ,02,F6,00,01,D7,00,00,6
      E
RA 590 DATA 80,02,FF,40,01,FB,
      00,00,6A,00,00,02,00,00
      ,04,00,00,00,00,00,00,0
      0
BB 600 DATA 00,00,00,00,00,00,
      00,00,00,00,00,00,00,00
      ,00,00,00,00,00,00,00,0
      0
KC 610 DATA 00,00,00,00,00,00,
      03,82,00,00,44,00,00,5E
      ,00,00,F7,00,09,FF,80,0
      6
PS 620 DATA 3D,40,00,F5,20,00,
      7E,00,00,40,00,00,20,00
      ,00,10,00,00,00,00,00,0
      0
CX 630 DATA 00,00,00,00,00,00,
      00,00,00,00,00,00,00,00
      ,00,00,00,00,00,00,00,0
      0
DM 640 DATA 00,00,00,00,00,06,
      00,00,08,00,00,2A,00,00
      ,FF,80,01,FB,00,02,DF,8
      0
DQ 650 DATA 04,FB,40,00,7E,20,
      00,08,00,00,30,00,00,00
      ,00,00,00,00,00,00,00,0
      0
XF 660 DATA 00,00,00,00,00,9E
AQ 670 DATA 78,A9,10,8D,14,03,
      A9,14,8D,15,03,20,4A,14
      ,58,60,AD,28,13,F0,03,4
      C
EG 680 DATA 65,FA,AD,48,14,8D,
      49,14,20,34,14,AD,49,14
      ,F0,EF,20,3B,14,CE,49,1
      4
QK 690 DATA 4C,21,14,EA,EA,EA,
      EA,EA,20,50,16,20,2A,16
      ,60,20,C9,16,20,C3,15,2
      0
QA 700 DATA 87,16,20,A8,16,60,
      00,EA,A2,80,8E,FF,13,A2
      ,05,AD,FF,13,9D,04,13,A
      8
AF 710 DATA 49,FF,9D,09,13,A9,
      01,9D,0E,13,A9,00,9D,1D
      ,13,C8,98,9D,13,13,C8,9
      8
PM 720 DATA 9D,18,13,4E,FF,13,
      CA,D0,DA,A9,FB,8D,03,13
      ,A9,FE,8D,01,13,A9,7F,8
      D
MS 730 DATA 02,13,A9,00,8D,28,
      13,8D,29,13,8D,30,13,8D
      ,00,13,A9,03,8D,23,13,8
      D
JS 740 DATA 24,13,8D,26,13,A9,
      3B,8D,25,13,60,EA,A9,18
      ,85,FD,A9,00,85,FC,AD,0
      1
BS 750 DATA 13,18,6D,01,13,90,
      A9,18,85,FD,A9,00,85,FC
      ,AD,02,13,18,6D,02,13,9
      0
FH 760 DATA 02,E6,FD,18,6D,02,
      13,85,FC,90,02,E6,FD,A0
      ,00,B1,FC,8D,DA,11,E6,F
      C
PX 770 DATA D0,02,E6,FD,B1,FC,
      8D,DB,11,E6,FC,D0,02,E6
      ,FD,B1,FC,0A,0A,8D,FF,1
      4
MG 780 DATA AD,E6,11,29,FB,0D,
      FF,14,8D,E6,11,60,EA,00
      ,A9,18,85,FD,A9,00,85,F
      C
GJ 790 DATA AD,00,13,18,6D,00,
      13,90,02,E6,FD,18,6D,00
      ,13,85,FC,90,02,E6,FD,A
      0
ED 800 DATA 00,B1,FC,8D,D6,11,
      E6,FC,D0,02,E6,FD,B1,FC
      ,8D,D7,11,E6,FC,D0,02,E
      6
ER 810 DATA FD,AD,E6,11,2D,01,
      13,11,FC,8D,E6,11,60,EA
      ,EA,EA,EA,EA,EA,A9,00,8
      D
GG 820 DATA 89,11,AD,D7,11,8D,
      D9,11,AD,D6,11,8D,D8,11
      ,AD,E6,11,29,01,F0,09,A
      D
XQ 830 DATA E6,11,09,02,8D,E6,
      11,60,AD,E6,11,29,FD,8D
      ,E6,11,60,EA,EA,EA,AD,0
      0
DA 840 DATA DC,29,10,C9,10,F0,
      0D,A5,FB,D0,07,20,47,15
      ,A9,01,85,FB,60,EA,AD,0
      0
SC 850 DATA DC,29,0F,C9,07,F0,
      05,C9,0B,F0,07,60,EE,00
      ,13,4C,00,15,CE,00,13,4
      C
BH 860 DATA 00,15,EA,EA,EA,A9,
      01,9D,0E,13,BD,09,13,2D
      ,15,D0,8D,15,D0,60,A9,0
      0
AP 870 DATA 85,FB,AD,15,D0,29,
      FD,8D,15,D0,60,A2,05,AD
      ,1F,D0,8D,04,13,AD,04,1
      3
XH 880 DATA 3D,04,13,F0,06,20,
      A7,15,EE,22,13,CA,D0,EF
      ,AD,04,13,29,02,F0,03,2
      0
GB 890 DATA B6,15,AD,1E,D0,8D,
      04,13,A2,05,AD,04,13,3D
      ,13,13,DD,13,13,D0,03,2
      0
PR 900 DATA 0E,16,AD,04,13,3D,
      18,13,DD,18,13,D0,03,20
      ,1D,16,CA,D0,E1,60,EE,1
      E
AP 910 DATA 13,D0,03,EE,1F,13,
      20,B6,15,4C,A7,15,60,EE
      ,20,13,D0,03,EE,21,13,4
      C
```

```
GJ 920 DATA 16,16,EA,EA,AD,23,
       13,C9,0E,D0,05,A9,01,8D
       ,23,13,AD,24,13,C9,08,D
       0
SK 930 DATA 05,A9,03,8D,24,13,
       AA,AD,23,13,9D,27,D0,EE
       ,23,13,EE,24,13,60,AD,2
       5
DH 940 DATA 13,C9,40,D0,05,A9,
       3A,8D,25,13,AD,26,13,C9
       ,08,D0,05,A9,02,8D,26,1
       3
DK 950 DATA AA,AD,25,13,9D,F8,
       1F,EE,25,13,AD,27,13,F0
       ,07,EE,27,13,EE,26,13,6
       0
GD 960 DATA A9,FD,8D,27,13,60,
       EA,EA,EA,AD,04,13,C9,05
       ,F0,01,60,EE,22,13,A2,0
       0
KG 970 DATA 8E,00,13,20,00,15,
       A9,7F,8D,02,13,4C,B6,14
       ,EA,EA,EA,EA,EA,EA,AD,2
       9
KC 980 DATA 13,D0,16,A9,FF,8D,
       29,13,AD,30,13,D0,06,EE
       ,02,13,4C,B6,14,CE,02,1
       3
AD 990 DATA 4C,B6,14,CE,29,13,
       60,EA,EA,AD,C7,16,D0,09
       ,A9,01,8D,C7,16,20,74,1
       5
QF 1000 DATA 60,CE,C7,16,4C,D6
        ,16
CE 1010 DATA FF,00,A9,FF,85,FC
        ,A9,3F,85,FD,A0,00,A9,
        AA,91,FC,C6,FC,D0,F8,C
        6,FD
SM 1020 DATA A5,FD,C9,1F,D0,F0
        ,A9,F7,85,FC,A9,1F,85,
        FD,A9,00,91,FC,C6,FC,D
        0,F8
KM 1030 DATA C6,FD,A5,FD,C9,1B
        ,D0,F0,60
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Monthly Calendar

Article on page 46.

```
XQ 100 REM COPYRIGHT 1988 COMP
       UTE! PUBLICATIONS, INC.
        - ALL RIGHTS RESERVED
DR 110 LC$=CHR$(14):RE$=CHR$(1
       5):GM$=CHR$(8):NR=7
RE 120 DIM CM(255)
DC 130 DIMMO$(12),LD(12),DA$(6
       0),MS$(50,NR+1),DD$(2,6
       0),L$(20),ML$(18),C(255
       )
DS 140 SP$=" ":FORI=0TO5:SP$=S
       P$+SP$:NEXT:SP$=LEFT$(S
       P$,31):SS$=LEFT$(SP$,10
       )
AM 150 POKE53280,15:POKE53281,
       11
CF 160 PRINT"{8}{CLR}"
SF 170 PRINTTAB(11)"MONTHLY CA
       LENDAR "
MX 190 PRINTTAB(11)"{DOWN} COP
       YRIGHT 1989 "
KH 200 PRINTTAB(7)"COMPUTE! PU
       BLICATIONS, INC."
QC 210 PRINTTAB(10)"ALL RIGHTS
        RESERVED"
GJ 220 FORI=27 TO 127:CM(I)=1:
       CM(I+128)=1:NEXT
MJ 230 I=2
CJ 240 READ A:IF A=-1 THEN270
GD 250 CM(A)=I:I=I+1:GOTO240
SR 260 DATA 17,145,29,157,147,
       13,19,20,148,95,-1
GP 270 I=0
CK 280 READ A$
BP 290 T=ASC(LEFT$(A$,1)):C(T)
       =I+1
BG 300 A$(I)=CHR$(49+I)+"
       {RVS}"+CHR$(T)+"{OFF}"+
       RIGHT$(A$,LEN(A$)-1)
JG 310 I=I+1:IF A$<>"QUIT" THE
       N280
EF 320 DATA "NEW CALENDAR","YE
       AR AND MONTH",MEMO,"ENH
       ANCE DATES",PRINT,SAVE,
       LOAD
GK 330 DATA QUIT
JA 340 FORH=1TO12:READMO$(H),L
       D(H):NEXTH
SF 350 N4=I-1
DX 360 FORI=0 TO N4:PRINT:PRIN
       TSPC(12) A$(I):NEXT
EA 370 GETA$:IF A$="" THEN370
GA 380 A2=ASC(A$):IF C(A2) THE
       N A2=C(A2):GOTO410
RJ 390 V=VAL(A$):IF V>0 AND V<
       =I THEN A2=V:GOTO410
RS 400 GOTO370
MR 410 ON A2 GOSUB3070,450,217
       0,1430,920,2310,2500,20
       70
SK 420 PRINT"{CLR}{2 DOWN}":GO
       TO360
JC 430 PRINT"{CLR}":IF YR$=""
       {SPACE}THEN PRINT"CHOOS
       E YEAR AND MONTH FIRST"
       :GOSUB460:GOTO430
BB 440 RETURN
QP 450 PRINT"{CLR}"
FP 460 PRINT"{HOME}{2 DOWN}ENT
       ER CALENDAR YEAR: ";
BX 470 INPUT T$
XM 480 IF T$="" THEN RETURN
GS 490 IF VAL(T$)<100 OR VAL(T
       $)>9999THEN GOTO450
PS 500 YR$=T$:Y=VAL(YR$)
KQ 510 PRINT"{CLR}"
BA 520 PRINT"{HOME}SELECT MONT
       H(1-12){4 DOWN}"
BJ 530 FORI=1TO9:PRINTTAB(10)"
       {BLK}"I"{8}"MO$(I):NEXT
HQ 540 FORI=10TO12:PRINTTAB(9)
       "{BLK}"I"{8}"MO$(I):NEX
       T
BQ 550 INPUT"{3 DOWN}ENTER MON
       TH";NU$
GX 560 NU=VAL(NU$):IFNU>=1ANDN
       U<=12THENHH=0:GOTO610
GA 570 FORI=1TO12
DA 580 IFNU$=MO$(I)THENNU=I:HH
       =0:GOTO610
GP 590 NEXTI
XK 600 GOTO520
DE 610 REM CALCULATIONS
BX 620 LD(2)=28:GOSUB2080
KG 630 A=(Y/100):B=INT(Y/100):
       C=A-B
BX 640 IFC=0THEN680
MH 650 A=(Y/4):B=INT(Y/4):C=A-
       B
XD 660 IFC=0THENAD=1:GOTO710
KX 670 AD=0:GOTO710
AQ 680 A=(Y/400):B=INT(Y/400):
       C=A-B
PR 690 IFC=0THENAD=1:GOTO710
JS 700 AD=0:GOTO710
AM 710 A=INT(Y/4):B=INT(Y/400)
       :C=INT(Y/100):D=A+B-C
BS 720 E=(Y+D)/7:F=INT((Y+D)/7
       ):G=(E-F)*7:SD=INT(G):H
       =G-SD
QM 730 IFH>.9THENSD=SD+1
CJ 740 SD=SD-AD
GK 750 IFSD<0THENSD=SD+7
AS 760 ONNUGOSUB1310,1320,1330
       ,1340,1350,1360,1370,13
       80,1390,1400,1410,1420
MF 770 IFDS>6THENDS=DS-7
MD 780 IFDS<0THENDS=DS+7
BB 790 D=0:IFFLAG=1THENFLAG=0:
       GOTO810
EQ 800 IFHH<>0THENRETURN
GA 810 FORI=1TO50
SH 820 IFI-DS<=0THENDA$(I)="":
       GOTO850
MD 830 IFI-DS>LD(NU)THENDA$(I)
       ="":GOTO850
BG 840 DA$(I)=STR$(I-DS):DA$(I
       )=RIGHT$(DA$(I),LEN(DA$
       (I))-1)
EP 850 NEXTI
CS 860 IFDS=0ANDLD(NU)=28THENR
       =4:GOTO890
PA 870 IFDA$(36)=""THENR=5:GOT
       O890
RG 880 R=6
GB 890 HD$=MO$(NU)+"{6 SPACES}
       "+YR$
DJ 900 CS=INT((40-LEN(HD$))/2)
DS 910 RETURN
SP 920 GOSUB430:IF A2<>5 THEN9
       50
XQ 930 T$="INCLUDE MEMO BAR IN
        PRINT OUT":GOSUB3030
SH 940 MB$="N":IF Q THEN MB$="
       Y"
MC 950 PRINT"{CLR}MAKE SURE PR
       INTER IS ON...{3 DOWN}"
XH 960 PRINT"< FOR MENU, ANY O
       THER KEY TO PRINT"
XR 970 GETCH$:IFCH$=""THEN970
DF 980 IF CH$="<" THEN RETURN
FH 990 GOSUB2100:CLOSE5:OPEN5,
       4,6:OPEN4,4:PRINT#4,LC$
       ;TAB(CS)HD$;RE$;
MG 1000 PRINT#4:PRINT#5,CHR$(2
        0)
RE 1010 PRINT#4,"{A}**********
        {R}**********{R}******
        ****{R}**********{R}**
        ********{R}******";
XS 1020 PRINT#4,"****{R}******
        ****{S}";GM$
MC 1030 PRINT#4,RE$;"-SUNDAY
        {4 SPACES}-MONDAY
        {4 SPACES}-TUESDAY
        {3 SPACES}-WEDNESDAY -
        THURSDAY{2 SPACES}";
JM 1040 PRINT#4,"-FRIDAY
        {4 SPACES}-SATURDAY
        {2 SPACES}-";GM$
XP 1050 GOSUB1280
DE 1060 FORI=1TOR
KR 1070 GOSUB1280
CF 1080 PRINT#4,RE$;
AB 1090 FORZ=1TO7:TB=(Z)*11:TB
        $=STR$(TB):TB$=RIGHT$(
        TB$,2)
KJ 1100 PRINT#4,"-";LC$;DA$(D+
        Z);RE$;CHR$(16)+TB$;
DJ 1110 NEXT Z
XE 1120 PRINT#4,CHR$(16)+"77";
        "-";GM$
BC 1130 PRINT#4,RE$;:D7=D-DS
KQ 1140 FORTT=1TONR
AG 1150 FORT=1TO7:TB=(T)*11:TB
        $=STR$(TB):TB$=RIGHT$(
        TB$,2)
```

```
FC 1160 D8=D7+T:IF D8<0 OR D8>
        31 THEN T$=SS$:GOTO118
        0
AB 1170 T$=MS$(D7+T,TT-1)
XA 1180 PRINT#4,"_";T$;CHR$(16
        )+TB$;
FR 1190 NEXT T
JK 1200 PRINT#4,CHR$(16)+"77";
        "_";GM$
DQ 1210 PRINT#4,RE$;
CA 1220 NEXT TT
GX 1230 D=D+7:NEXTI
KS 1240 IFMB$="N"THEN2120
FB 1250 PRINT#4,RE$;"{Q}******
        ****{E}**********+****
        ******{E}**********{E}
        **********+***";
KA 1260 PRINT#4,"*******{E}***
        *******{W}"GM$
AJ 1270 CLOSE4,4:GOTO1700
XK 1280 PRINT#4,RE$;"{Q}******
        ****+**********+******
        ****+**********+******
        ****+***";
SB 1290 PRINT#4,"*******+*****
        *****{W}";GM$
AA 1300 RETURN
XP 1310 DS=SD:RETURN
QD 1320 DS=SD+3:LD(NU)=LD(NU)+
        AD:RETURN
DF 1330 DS=SD+3+AD:RETURN
GG 1340 DS=SD-1+AD:RETURN
XF 1350 DS=SD+1+AD:RETURN
RA 1360 DS=SD+4+AD:RETURN
RA 1370 DS=SD-1+AD:RETURN
KA 1380 DS=SD+2+AD:RETURN
XD 1390 DS=SD+5+AD:RETURN
KR 1400 DS=SD+AD:RETURN
HC 1410 DS=SD+3+AD:RETURN
CQ 1420 DS=SD+5+AD:RETURN
SS 1430 REM ENHANCE DATES
KC 1440 PRINT"{CLR}":IF YR$=""
         THEN PRINT"CHOOSE YEA
        R AND MONTH FIRST":GOS
        UB460
JD 1450 DU=0:PRINT"{CLR}{8}";
DS 1460 PRINTHD$
QB 1470 PRINT"{DOWN}SUN
        {2 SPACES}MON
        {2 SPACES}TUE
        {2 SPACES}WED
        {2 SPACES}THU
        {2 SPACES}FRI
        {2 SPACES}SAT{DOWN}"
AX 1480 FORU=0TO5
BE 1490 FORUU=1TO7
SF 1500 DO=(UU-1)*5:PRINTTAB(D
        O)DA$(UU+DU);
AR 1510 T=U*7+UU
ME 1520 NEXTUU
DR 1530 PRINT"{DOWN}":DU=DU+7
HD 1540 NEXTU
GQ 1550 PRINT" INPUT 'Q' WHEN
        {SPACE}FINISHED ENHANC
        ING DATES":INPUT "ENTE
        R DATE";MD$
AB 1560 IF MD$="Q" OR MD$="Q"
        {SPACE}THEN RETURN
XR 1570 MD=VAL(MD$)
CC 1580 IFMD<1 OR MD>LD(NU)THE
        NPRINT"{4 UP}":GOTO155
        0
DC 1590 PR$="{CLR}ENTER MESSAG
        E FOR{BLK} "+MO$(NU)+
        {SPACE}" "+STR$(MD)+"
        {8}"
KX 1600 B$="":H=NR:W=10
QK 1610 FOR I=0 TO NR
AP 1620 T$=MS$(MD,I):IF LEN(T$
        )<>W THEN T$=SS$
KH 1630 B$=B$+T$
RK 1640 NEXT
QM 1650 GOSUB2630:J=0
MF 1660 FOR I=1 TO H*W+1 STEP
        {2 SPACES}W
DP 1670 MS$(MD,J)=MID$(B$,I,W)
        :J=J+1
BR 1680 NEXT
DX 1690 GOTO1450
MF 1700 IFNU=1THENN1=12:N2=2:Y
        (1)=Y-1:Y(2)=Y:GOTO173
        0
GS 1710 IFNU=12THENN1=11:N2=1:
        Y(1)=Y:Y(2)=Y+1:GOTO17
        30
HQ 1720 N1=NU-1:N2=NU+1:Y(1)=Y
        :Y(2)=Y
XJ 1730 NU=N1:Y=Y(1):HH=1:CH=1
        :D=0
QR 1740 GOSUB620
MS 1750 D=0
SG 1760 FORI=1TO50
ED 1770 IFI-DS<=0THENDD$(HH,I)
        ="{3 SPACES}":GOTO1810
EC 1780 IFI-DS>LD(NU)THENDD$(H
        H,I)="{3 SPACES}":GOTO
        1810
HJ 1790 IFI-DS<10THENDD$(HH,I)
        =" "+STR$(I-DS):GOTO18
        10
AJ 1800 DD$(HH,I)=STR$(I-DS)
KG 1810 NEXTI:HD$(HH)=MO$(NU)+
        "{3 SPACES}"+STR$(Y(HH
        )):CS(HH)=INT((22-LEN(
        HD$(HH)))/2)
FD 1820 IFHH=2THENCS(HH)=CS(HH
        )+56
GB 1830 CS$(HH)=STR$(CS(HH)):C
        S$(HH)=RIGHT$(CS$(HH),
        2)
SP 1840 IFHH=1THENHH=2:NU=N2:Y
        =Y(2):GOSUB620:GOTO175
        0
QX 1850 L$(1)="_"+CHR$(16)+"22
        _"+CHR$(16)+"55_"+CHR$
        (16)+"77_"
RX 1860 L$(2)="_"+CHR$(16)+CS$
        (1)+HD$(1)+CHR$(16)+"2
        2_"+LC$+"{5 SPACES}MEM
        OS"+RE$
JP 1870 L$(2)=L$(2)+CHR$(16)+"
        55_"+CHR$(16)+CS$(2)+H
        D$(2)+CHR$(16)+"77_"
HF 1880 L$(3)=L$(1)
PH 1890 L$(4)="_ SU MO TU WE T
        H FR SA_"
AQ 1900 L$(4)=L$(4)+CHR$(16)+"
        55_ SU MO TU WE TH FR
        {SPACE}SA_"
FB 1910 L$(5)=L$(1):J=6
HG 1920 FORI=6TO18STEP2
KP 1930 L$(I)="_"
HH 1940 FORII=1TO7
EM 1950 L$(I)=L$(I)+DD$(1,II+D
        )
DF 1960 NEXTII
AF 1970 T$=ML$(J):IF LEN(T$)<3
        1 THEN T$=SP$:ML$(J)=S
        P$
RC 1980 L$(I)=L$(I)+CHR$(16)+"
        22_ "+T$+"_":J=J+1
JC 1990 FORII=1TO7:L$(I)=L$(I)
        +DD$(2,D+II):NEXTII
GB 2000 L$(I)=L$(I)+CHR$(16)+"
        77_"
BF 2010 L$(I+1)=L$(1)
FQ 2020 D=D+7:NEXTI
MM 2030 L$(18)="{Z}**********
        **********{E}********
        ********************"
AX 2040 L$(18)=L$(18)+"*****
        {E}******************
        **{X}"
AP 2050 GOSUB2100:OPEN4,4:FORI
        =1TO18:PRINT#4,RE$;L$(
        I);GM$:NEXTI
XS 2060 CLOSE4,4:Y=VAL(YR$):NU
        =VAL(NU$):GOSUB620:RET
        URN
BF 2070 POKE 53280,14:POKE5328
        1,6:PRINT"{CLR}{7}";:C
        LR:END
KJ 2080 PRINT"{CLR}{BLK}CALCUL
        ATING...{8}"
KF 2090 RETURN
HR 2100 PRINT"{CLR}{WHT}{RVS}P
        RINTING{OFF}...(PRESS
        {SPACE}RUN/STOP TO ABO
        RT){8}"
HC 2110 RETURN
AD 2120 PRINT#4,RE$;"{Z}******
        ****{E}**********{E}**
        ********{E}**********
        {E}**********{E}***";
EB 2130 PRINT#4,"*******{E}***
        *******{X}";GM$
PK 2140 GOTO2060
XH 2150 DATA JANUARY,31,FEBRUA
        RY,28,MARCH,31,APRIL,3
        0,MAY,31,JUNE,30,JULY,
        31
SB 2160 DATA AUGUST,31,SEPTEMB
        ER,30,OCTOBER,31,NOVEM
        BER,30,DECEMBER,31
DK 2170 PR$="ENTER MEMOS"
SF 2180 B$="":W=31:H=6
SM 2190 FORX=6TO12
XQ 2200 T$=ML$(X):T$=T$+LEFT$(
        SP$,W-LEN(T$)):B$=B$+T
        $
FM 2210 NEXT
AD 2220 GOSUB2630
GJ 2230 FOR X=6 TO 12
FE 2240 ML$(X)=ML$(X)+LEFT$(SP
        $,(31-LEN(ML$(X)))):NE
        XT:X=6

EB 2250 FOR I=1 TO H*W+1 STEP
        {2 SPACES}W
XP 2260 T$=MID$(B$,I,W):IF T$=
        S2$ THEN T$=" "
SC 2270 ML$(X)=T$:X=X+1
BA 2280 NEXT
CM 2290 ML$(13)=SP$
GS 2300 RETURN
MS 2310 GOSUB430:NM$="":INPUT"
        {CLR}FILENAME FOR SAVE
        ";NM$
KE 2320 IF NM$="" THENRETURN
DQ 2330 OPEN15,8,15,"I0":OPEN2
        ,8,2,NM$+",W,S":INPUT#
        15,EN,EM$,ET,ES
RF 2340 IFEN>1THENPRINTEN;EM$;
        ET;ES:FORI=1TO300:NEXT
        I:CLOSE2:CLOSE15:GOTO2
        310
SC 2350 PRINT"{CLR}{10 DOWN}";
        TAB(10)"SAVING CALENDA
        R ...."
XS 2360 FORP=1TO31
DC 2370 FORQ=0TONR
DK 2380 T$=MS$(P,Q)
SH 2390 IF T$="" THENT$=SS$
ME 2400 PRINT#2,"X"T$"X"
MR 2410 NEXTQ:NEXTP
PR 2420 FORP=6TO12:T$=ML$(P)
QX 2430 IF LEN(T$)<>31 THEN T$
        =T$+LEFT$(SP$,31-LEN(T
        $))
XJ 2440 PRINT#2,"X"T$"X":NEXTP
XB 2450 IF MB$="" THEN MB$="N"
JG 2460 IF HD$="" THEN HD$=" "
AF 2470 IF YR$="" THEN YR$="19
        89"
KF 2480 PRINT#2,MB$:PRINT#2,HD
        $:PRINT#2,YR$:PRINT#2,
        NU$
SC 2490 CLOSE2:CLOSE15:X=FRE(0
        ):RETURN
```

```
HQ 2500 NM$="":INPUT"{CLR}FILE
        NAME TO LOAD";NM$
MJ 2510 IF NM$="" THENRETURN
QX 2520 OPEN15,8,15,"I0":OPEN2
        ,8,2,NM$+",S,R":INPUT#
        15,EN,EM$,ET,ES
HF 2530 IFEN>1THENPRINTEN;EM$;
        ET;ES:FORI=1TO300:NEXT
        I:CLOSE2:CLOSE15:GOTO2
        500
KF 2540 PRINT"{CLR}{10 DOWN}";
        TAB(10)"LOADING CALEND
        AR ...."
RQ 2550 FORP=1TO31:FORQ=0TONR
QK 2560 INPUT#2,T$:MS$(P,Q)=MI
        D$(T$,2,10)
HJ 2570 NEXTQ:NEXTP
QX 2580 FORP=6TO12
BA 2590 INPUT#2,T$:ML$(P)=MID$
        (T$,2,31)
FA 2600 NEXTP
KX 2610 INPUT#2,MB$,HD$,YR$,NU
        $:Y=VAL(YR$):NU=VAL(NU
        $)
SC 2620 CLOSE2:CLOSE15:GOSUB62
        0:X=FRE(0):RETURN
CE 2630 PY=Y
DQ 2640 X=0:Y=0:MT=H*W+1:PRINT
        "{CLR}";PR$:PRINT"PRES
        S < WHEN DONE"
GM 2650 PRINT"{HOME}{DOWN}":PR
        INTTAB(W)"L":FORI=1 TO
         H:PRINT:NEXT:PRINTTAB
        (W)"O"
PD 2660 PRINT"{HOME}{2 DOWN}":
        FOR I=1 TO H*W+1 STEP
        {SPACE}W
PP 2670 PRINTMID$(B$,I,W):NEXT
DG 2680 T=X+Y*40+1144:IF X=W T
        HEN T=T-X+40
KK 2690 POKE T,PEEK(T) OR 128
BC 2700 GETA$:IF A$="" THEN270
        0
JA 2710 A=ASC(A$)
BX 2720 ON CM(A) GOTO2950,2740
        ,2760,2780,2810,2840,2
        850,2890,2900,3000,302
        0
AQ 2730 GOTO2700
PJ 2740 IF Y<H-1 THEN Y=Y+1:GO
        TO2660
MS 2750 GOTO2700
XH 2760 IF Y>0 THEN Y=Y-1:GOTO
        2660
RA 2770 GOTO2700
AF 2780 X=X+1:IF X<W THEN2660
KD 2790 IF Y=H-1 THEN X=X-1:GO
        TO2660
AJ 2800 Y=Y+1:X=0:GOTO2660
ES 2810 X=X-1:IF X=>0 THEN2660
DP 2820 IF Y>0 THEN X=W-1:Y=Y-
        1:GOTO2660
HX 2830 X=0:GOTO2660
QQ 2840 B$="":FORI=1 TO H*W+1:
        B$=B$+" ":NEXT:GOTO264
        0
QG 2850 IF Y=H-1 THEN3020
KF 2860 IF X=W AND Y=H-2 THEN3
        020
PM 2870 IF X=W THEN Y=Y+2:GOTO
        2660
DA 2880 X=0:Y=Y+1:GOTO2660
XM 2890 X=0:Y=0:GOTO2660
HP 2900 A$="":X=X-1:IF X=>0 TH
        EN2930
KB 2910 IF Y>0 THEN X=W-1:Y=Y-
        1:GOTO2930
CQ 2920 X=0:GOTO2700
XR 2930 T=X+Y*W
RP 2940 L=LEN(B$):B$=LEFT$(B$,
        T)+RIGHT$(B$,L-T-1)+"
        {SPACE}":GOTO2660
JG 2950 T=X+Y*W:IF T=>MT THEN2
        700
BD 2960 L=LEN(B$):B$=LEFT$(B$,
        T)+A$+RIGHT$(B$,L-T-1)
BK 2970 X=X+1:IF X<W THEN2660
GJ 2980 IF Y=H-1 THEN X=X-1:GO
        TO2660
MS 2990 Y=Y+1:X=0:GOTO2660
DB 3000 T=X+Y*W:L=LEN(B$):B$=L
        EFT$(B$,T)+" "+RIGHT$(
        B$,L-T):B$=LEFT$(B$,H*
        W)
HA 3010 GOTO2660
DH 3020 Y=PY:RETURN
QS 3030 PRINT"{CLR}{DOWN}"T$;"
         (Y/N){2 SPACES}";"N
        {3 LEFT}";:INPUT R$
SQ 3040 IF R$="N" THEN Q=0:RET
        URN
CF 3050 IF R$="Y" THEN Q=1:RET
        URN
JB 3060 GOTO3030
PA 3070 IF YR$="" THEN3130
QR 3080 T$="CLEAR OUT "+MO$(NU
        )+" "+YR$:GOSUB3030
XD 3090 IF Q=0 THEN RETURN
AP 3100 GOSUB2080
ES 3110 FORP=1TO31:FORQ=0TONR:
        MS$(P,Q)=SS$:NEXT:NEXT
SQ 3120 FORX=6TO12:ML$(X)=SP$:
        NEXT
QC 3130 GOSUB450
EQ 3140 MB$="N":T$="INCLUDE ME
        MO BAR":GOSUB3030
AP 3150 IF Q THEN MB$="Y":GOSU
        B2170
MJ 3160 T$="ENHANCE DATES":GOS
        UB3030
EA 3170 IF Q THEN GOSUB1430
HQ 3180 T$="PRINT IT NOW":GOSU
        B3030
FX 3190 IF Q THEN GOSUB920
AF 3200 T$="SAVE CALENDAR TO D
        ISK":GOSUB3030
FH 3210 IF Q THEN GOSUB2310
HJ 3220 RETURN
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

The GEOS Column:
Screen Dumper

See instructions in article on page 63 before typing in.

Program 1: Screen Dumper

```
16A5:8D ED 10 20 B5 10 20 11 57
16AD:10 20 D1 10 4C 3E C2 A9 AF
16B5:10 85 0F A9 EE 85 0E A9 1B
16BD:09 85 10 A9 01 85 11 A9 56
16C5:00 85 17 A9 00 85 16 20 33
16CD:3B C2 A9 00 C5 11 D0 47 D8
16D5:A9 10 85 0F A9 EE 85 0E 9E
16DD:A9 00 85 02 20 08 C2 20 76
16E5:0C 79 20 00 79 20 03 79 46
16ED:E0 00 F0 03 4C 79 10 A2 E3
16F5:00 8E FF 10 20 7A 10 A9 7B
16FD:11 85 03 A9 00 85 02 A9 D2
1705:13 85 05 A9 80 85 04 20 9B
170D:06 79 AE FF 10 20 AC 10 DC
1715:E0 C8 D0 DD 20 09 79 60 56
171D:20 3C C1 A5 0D 85 03 A5 27
1725:0C 85 02 A9 11 85 05 A9 E7
172D:00 85 04 A9 01 85 07 A9 AD
1735:40 85 06 20 7E C1 A9 01 F6
173D:85 03 A9 40 85 02 A9 12 C1
1745:85 05 A9 40 85 04 20 78 A5
174D:C1 60 E8 E8 E8 E8 E8 E8 C5
1755:E8 E8 60 A9 79 85 03 A9 6A
175D:00 85 02 A9 16 85 05 A9 42
1765:00 85 04 A9 06 85 07 A9 0E
176D:40 85 06 20 7E C1 60 A9 45
1775:16 85 03 A9 00 85 02 A9 CE
177D:79 85 05 A9 00 85 04 A9 CC
1785:06 85 07 A9 40 85 06 20 D7
178D:7E C1 60 00 00 00 00 00 77
```

Program 2: BSD

```
HR 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS -- ALL
      {SPACE}RIGHTS RESERVED
KJ 20 DEF FNAS(A)=ASC(A$+CHR$(
      0))
RS 30 DV=8:DN=0:IT=18:IS=0:NM$
      ="SCREENDUMPER":DN$=STR$
      (DN)
XF 40 OPEN15,DV,15,"I"+DN$:GOS
      UB310:IFEN<>0THEN300
SS 50 N2$="TEMP"+TI$:OPEN2,DV,
      8,DN$+":"+N2$+",P,W":GOS
      UB310:IFEN<>0THEN300
JA 60 FORI=2TO255:READA:PRINT#
      2,CHR$(A);:NEXTI:CLOSE2
EH 70 OPEN1,DV,3,"#":GOSUB310:
      IFEN<>0THEN300
KD 80 PRINT#15,"U1";3;DN;IT;IS
      :GOSUB310:IFEN<>0THEN300
PR 90 GET#1,A$:DT=FNAS(0):GET#
      1,A$:DS=FNAS(0):NT=DT:NS
      =DS
HF 100 GOSUB330:GET#1,A$:NT=FN
       AS(0):GET#1,A$:NS=FNAS(
       0):I=2
BG 110 PRINT#15,"B-P";3;I:J=0:
       N1$="":GET#1,A$:A=FNAS(
       0)
DD 120 GET#1,A$,A$:IFA<128THEN
       160
CD 130 GET#1,A$:IFA$<>CHR$(160
       )THENN1$=N1$+A$:J=J+1:I
       FJ<16THEN130
BG 140 IFN1$=NM$THENFT=CT:FS=C
       S:FI=I
QA 150 IFN1$=N2$THENTT=CT:TS=C
       S:T=I
SE 160 I=I+32:IFI<256THEN110
XB 170 IFNT<>0THEN100
HJ 180 IFFT<>0ANDTT<>0THEN200
BK 190 PRINT"{CLR}FILE NOT FOU
       ND!":GOTO300
RS 200 PRINT#15,"U1";3;DN;TT;T
       S:GOSUB310:IFEN<>0THEN3
       00
MG 210 PRINT#15,"B-P";3;T:PRIN
       T#1,CHR$(0);:GET#1,A$:X
       T=FNAS(0):GET#1,A$:XS=F
       NAS(0)
GJ 220 PRINT#15,"U2";3;DN;TT;T
       S:GOSUB310:IFEN<>0THEN3
       00
FF 230 PRINT#15,"U1";3;DN;FT;F
       S:GOSUB310:IFEN<>0THEN3
       00
CS 240 PRINT#15,"B-P";3;FI:PRI
       NT#1,CHR$(131);:PRINT#1
       5,"B-P";3;FI+19
CB 250 PRINT#1,CHR$(XT)+CHR$(X
       S);:FORI=0TO6:READA:PRI
       NT#1,CHR$(A);:NEXTI
HS 260 GET#1,A$:A=FNAS(0):GET#
       1,A$:B=FNAS(0):A=A+1:IF
       A=256THENA=0:B=B+1
```

```
PB 270 PRINT#15,"B-P";3;FI+28:
       PRINT#1,CHR$(A)+CHR$(B)
       ;
SC 280 PRINT#15,"U2";3;DN;FT;F
       S:GOSUB310:IFEN<>0THEN3
       00
AF 290 PRINT"ALL DONE!"
MH 300 CLOSE1:CLOSE2:CLOSE15:E
       ND
BS 310 INPUT#15,EN,EM$,ET,ES:I
       FEN<>0THENPRINTEN;EM$;E
       T;ES
XM 320 RETURN
KD 330 CT=NT:CS=NS:PRINT#15,"U
       1";3;DN;CT;CS:GOSUB310:
       IFEN<>0THEN300
HP 340 RETURN
RJ 350 DATA 3,21,191,255,255,2
       55,128
SR 360 DATA 0,1,184,0,1,164,0
EK 370 DATA 1,164,0,1,164,0,1
BK 380 DATA 184,0,1,129,32,1,1
       29
JA 390 DATA 32,1,129,32,1,129,
       224
DG 400 DATA 1,128,0,1,128,8,12
       9
GR 410 DATA 128,13,129,128,10,
       129,128
MB 420 DATA 8,129,128,0,57,128
       ,0
SG 430 DATA 37,128,0,57,128,0,
       33
GS 440 DATA 255,255,255,131,5,
       0,0
DQ 450 DATA 16,64,28,0,16,83,9
       9
XD 460 DATA 114,101,101,110,68
       ,117,109
RB 470 DATA 112,32,32,86,49,46
       ,48
XQ 480 DATA 0,0,0,0,84,111,100
BK 490 DATA 100,32,74,46,32,67
       ,114
RS 500 DATA 117,115,97,110,32,
       32,32
CG 510 DATA 32,32,0,0,0,0,0
XD 520 DATA 0,0,0,0,0,0,0
PA 530 DATA 0,0,0,0,0,0,0
HA 540 DATA 0,0,0,0,0,0,0
DB 550 DATA 0,0,0,0,0,0,0
XG 560 DATA 0,0,0,0,0,0,0
BR 570 DATA 0,0,0,0,84,104,105
EK 580 DATA 115,32,105,115,32,
       97,32
AE 590 DATA 115,99,114,101,101
       ,110,32
QK 600 DATA 100,117,109,112,32
       ,100,101
RQ 610 DATA 115,107,32,97,99,9
       9,101
QC 620 DATA 115,115,111,114,12
       1,46,0
QM 630 DATA 0,0,0,0,0,0,0
JP 640 DATA 0,0,0,0,0,0,0
EP 650 DATA 0,0,0,0,0,0,0
AJ 660 DATA 0,0,0,0,0,0,0
QK 670 DATA 0,0,0,0,0,0,0
JS 680 DATA 0,0,0,0,0,0,0
ES 690 DATA 0,0,0,0,0,0,0
RS 700 DATA 0,0,0,0,0,0,0
BS 710 DATA 0,0
XH 720 DATA 0,5,86,10,21,13,41
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Bitmap Buster

See instructions in article on page 44 before typing in.

```
0801:0B 0B 0A 00 9E 20 32 30 A4
0809:36 32 00 00 00 A9 00 85 EC
0811:9D 8D 8A 02 A5 BA 8D 75 6D
0819:0D A9 93 20 D2 FF A9 00 78
0821:8D 20 D0 8D 21 D0 A9 07 99
0829:85 D3 A0 0C A9 5E 20 1E EA
0831:AB A9 0D 85 D3 A0 0C A9 5E
0839:7E 20 1E AB A9 0D 85 D3 6F
0841:A0 0C A9 91 20 1E AB A9 6D
0849:0D 85 D3 A0 0C A9 A0 20 2E
0851:1E AB A9 0D 85 D3 A0 0C 2A
0859:A9 AD 20 1E AB A9 03 85 1F
0861:D3 A0 0C A9 BE 20 1E AB FD
0869:A9 0B 85 D3 A0 0C A9 EB 73
0871:20 1E AB A9 02 85 D3 A0 97
0879:0D A9 00 20 1E AB A9 0A 79
0881:85 D3 A0 0D A9 28 20 1E 7A
0889:AB A9 0E 8D 86 02 20 9C 8D
0891:0B 20 E4 FF C9 85 D0 03 D4
0899:4C 6F 09 C9 86 D0 03 4C 33
08A1:BE 0B C9 87 D0 15 EE 75 B3
08A9:0D AD 75 0D C9 0C 90 05 CF
08B1:A9 08 8D 75 0D 20 9C 0B CE
08B9:4C 92 08 C9 89 D0 31 A2 C6
08C1:68 A0 D9 A9 0A 20 B2 0B 45
08C9:A9 02 8D 7C 0D A9 10 8D 65
08D1:7D 0D A9 44 8D 7E 0D 8D 6B
08D9:7F 0D A9 60 8D 7A 0D A2 3B
08E1:5C A0 00 8C 76 0D 8E 77 8D
08E9:0D A2 80 A0 00 4C 69 0A 51
08F1:C9 8A D0 43 A2 B8 A0 D9 EA
08F9:A9 0A 20 B2 0B A9 07 8D 2B
0901:7C 0D A9 0F 8D 7D 0D A0 D7
0909:00 B9 6B 0D 99 7E 0D C8 71
0911:C0 08 D0 F5 20 3C 0A AD B2
0919:83 0D C9 20 D0 03 4C 1A B0
0921:08 A9 60 8D 7A 0D A2 60 34
0929:A0 00 8C 76 0D 8E 77 0D 23
0931:A2 87 A0 11 4C 69 0A C9 81
0939:8B D0 29 A2 08 A0 DA A9 B6
0941:0A 20 B2 0B A9 00 8D 7C 4C
0949:0D A9 10 8D 7D 0D A9 40 DA
0951:8D 7A 0D A2 40 A0 00 8C A5
0959:76 0D 8E 77 0D A2 5F A0 85
0961:80 4C 69 0A C9 8C D0 03 B9
0969:4C 66 FE 4C 92 08 A9 03 EA
0971:8D 00 DD A9 1F 8D 18 D0 D0
0979:AD 11 D0 09 20 8D 11 D0 7B
0981:A9 0E 8D 21 D0 20 03 0A C6
0989:A9 01 20 17 0A A9 06 A2 CB
0991:D8 A0 00 84 FD 86 FE A2 2B
0999:03 A0 00 91 FD C8 D0 FB 1F
09A1:E6 FE CA D0 F6 91 FD C8 10
09A9:C0 E8 D0 F9 20 E4 FF C9 6E
09B1:0D D0 06 20 31 0B 4C AD 3D
09B9:09 C9 85 D0 21 A9 93 20 77
09C1:D2 FF A9 00 8D 21 D0 A9 AE
09C9:97 8D 00 DD A9 14 8D 18 B9
09D1:D0 A9 C8 8D 16 D0 A9 1B 0B
09D9:8D 11 D0 4C 1A 08 C9 86 E0
09E1:D0 0E AD 72 0D 49 01 8D D9
09E9:72 0D 20 17 0A 4C AD 09 D3
09F1:C9 87 D0 0B AD 73 0D 49 34
09F9:01 8D 73 0D 20 03 0A 4C 9C
0A01:AD 09 AD 73 0D F0 09 AD 07
0A09:16 D0 09 10 8D 16 D0 60 45
0A11:A9 C8 8D 16 D0 60 AD 72 15
0A19:0D D0 02 A9 10 A2 04 A0 76
0A21:00 84 FD 86 FE A2 03 A0 A7
0A29:00 91 FD C8 D0 FB E6 FE 31
0A31:CA D0 F6 91 FD C8 C0 E8 54
0A39:D0 F9 60 18 A2 10 A0 08 60
0A41:20 F0 FF A0 0D A9 49 20 6D
0A49:1E AB 20 E4 FF F0 FB C9 2F
0A51:0D F0 14 C9 41 90 F3 C9 45
0A59:51 B0 EF 8D 83 0D A2 80 2F
0A61:A0 DA A9 00 20 B2 0B 60 F3
0A69:8C 78 0D 8E 79 0D 18 A2 3F
0A71:10 A0 07 20 F0 FF A0 0D 6E
0A79:A9 3D 20 1E AB AD 7C 0D B1
0A81:8D 7B 0D 20 C6 0A 20 E4 62
0A89:FF F0 FB C9 0D F0 3E C9 68
0A91:14 F0 1F C9 20 90 EF C9 59
0A99:60 B0 EB AC 7B 0D CC 7D 79
0AA1:0D B0 E3 99 7E 0D 20 D2 B9
0AA9:FF 20 C6 0A EE 7B 0D 4C 0B
0AB1:87 0A AD 7B 0D CD 7C 0D 1F
0AB9:F0 08 A9 14 20 D2 FF CE D9
0AC1:7B 0D 4C 87 0A A0 0D A9 6F
0AC9:64 20 1E AB 60 AD 7B 0D 54
0AD1:CD 7C 0D D0 03 4C 1A 08 20
0AD9:A9 20 20 D2 FF AD 7E 0D BC
0AE1:C9 81 D0 13 AC 7B 0D C0 B4
0AE9:0F F0 0C A9 20 99 7E 0D 4F
0AF1:C8 EE 7B 0D 4C E8 0A AE 2F
0AF9:7A 0D 20 67 0B A9 01 AE B8
0B01:75 0D A8 20 BA FF AD 7B D8
0B09:0D A2 7E A0 0D 20 BD FF 8C
0B11:AE 76 0D AC 77 0D 86 FB 81
0B19:84 FC A9 FB AE 78 0D AC C3
0B21:79 0D 20 D8 FF A2 11 A0 16
0B29:07 18 20 F0 FF 4C 2A 0C 6D
0B31:AD 74 0D C9 00 D0 02 A2 63
0B39:40 C9 01 D0 02 A2 60 C9 34
0B41:02 D0 02 A2 80 C9 03 D0 F8
0B49:02 A2 A0 C9 04 D0 02 A2 C3
0B51:C0 C9 05 D0 02 A2 E0 EE 33
0B59:74 0D AD 74 0D C9 06 D0 56
0B61:05 A9 00 8D 74 0D 78 A5 AB
0B69:01 29 FC 85 01 A9 20 85 B6
0B71:FC 86 FE A9 00 85 FB 85 B5
0B79:FD A2 20 A0 00 B1 FB 85 89
0B81:02 B1 FD 91 FB A5 02 91 E9
0B89:FD C8 D0 F1 E6 FC E6 FE 02
0B91:CA D0 EA A5 01 09 03 85 B0
0B99:01 58 60 18 A2 15 A0 1C 9A
0BA1:20 F0 FF A9 00 AE 75 0D 51
0BA9:20 CD BD A9 20 20 D2 FF BC
0BB1:60 86 FB 84 FC A0 27 91 AB
0BB9:FB 88 10 FB 60 A9 93 20 A2
0BC1:D2 FF A9 01 AE 75 0D A0 8C
0BC9:00 20 BA FF A9 02 A2 69 43
0BD1:A0 0D 20 BD FF 20 C0 FF 5D
0BD9:A2 01 20 C6 FF 20 CF FF 12
0BE1:20 CF FF 20 CF FF 20 CF 8C
0BE9:FF F0 31 A5 90 29 40 D0 37
0BF1:2B 20 CF FF AA 20 CF FF 15
0BF9:20 CD BD A9 20 20 D2 FF 0D
0C01:20 CF FF F0 05 20 D2 FF 7A
0C09:D0 F6 A9 0D 20 D2 FF AD 47
0C11:8D 02 C9 01 F0 F9 A5 91 06
0C19:10 02 D0 C7 A9 01 20 C3 A5
0C21:FF 20 E7 FF A9 0D 20 D2 D2
0C29:FF A9 0F AE 75 0D A8 20 C9
0C31:BA FF A9 00 20 BD FF 20 F3
0C39:C0 FF A2 0F 20 C6 FF 20 33
0C41:CF FF 20 D2 FF C9 0D D0 84
0C49:F6 A9 0F 20 C3 FF 20 33 BC
0C51:F3 A9 00 85 C6 20 E4 FF A6
0C59:F0 FB 4C 1A 08 8E 08 11 AF
0C61:11 9F 42 20 49 20 54 20 C7
0C69:4D 20 41 20 50 20 20 20 BD
0C71:42 20 55 20 53 20 54 20 43
0C79:45 20 52 0D 00 11 11 11 CE
0C81:11 05 46 49 4C 45 20 46 BE
0C89:4F 52 4D 41 54 53 0D 00 A5
0C91:11 9A 12 46 32 92 20 44 DF
0C99:4F 4F 44 4C 45 0D 00 11 E9
0CA1:12 46 34 92 20 4B 4F 41 12
0CA9:4C 41 0D 00 11 12 46 36 6D
0CB1:92 20 53 54 41 4E 44 41 D7
0CB9:52 44 20 0D 00 11 11 11 58
0CC1:11 11 12 46 31 92 20 56 B7
0CC9:49 45 57 20 53 43 52 45 56
0CD1:45 4E 20 20 20 12 46 33 2F
0CD9:92 20 44 49 53 4B 20 44 AC
0CE1:49 52 45 43 54 4F 52 59 ED
0CE9:0D 00 11 12 46 35 92 20 18
0CF1:44 52 49 56 45 20 4E 55 EB
0CF9:4D 42 45 52 3A 0D 00 11 2E
0D01:97 28 43 29 20 31 39 38 5C
0D09:39 20 43 4F 4D 50 55 54 CF
0D11:45 21 20 50 55 42 4C 49 B4
```

```
0D19:43 41 54 49 4F 4E 53 2C CA
0D21:20 49 4E 43 2E 0D 00 41 82
0D29:4C 4C 20 52 49 47 48 54 F1
0D31:53 20 52 45 53 45 52 56 46
0D39:45 44 2E 00 96 46 49 4C 79
0D41:45 4E 41 4D 45 3A 20 00 E1
0D49:96 45 4E 54 45 52 20 41 04
0D51:20 4C 45 54 54 45 52 20 F8
0D59:28 41 2D 50 29 3A 20 12 07
0D61:20 92 00 12 20 92 9D 00 D7
0D69:24 30 81 50 49 43 20 20 8E
0D71:20 00 00 00 00 00 00 00 9B
0D79:00 00 00 00 00 00 00 00 93
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

The Anglers

See instructions in article on page 38 before typing in.

```
0801:0C 08 01 00 9E 32 30 36 8D
0809:31 00 00 00 A9 93 20 D2 60
0811:FF A2 00 A9 03 8D 1D D0 BD
0819:8E 10 D0 8E 17 D0 8E 1C AC
0821:D0 A9 06 9D 58 DA 9D E7 EF
0829:DA E8 D0 F7 8A 9D 00 D4 1A
0831:E8 E0 19 D0 F8 A9 80 8D 1B
0839:0E D4 8D 0F D4 8D 12 D4 FD
0841:20 C1 11 A9 7F 8D 15 D0 BB
0849:A2 09 A0 0D 18 20 F0 FF F4
0851:A2 00 BD E1 14 C9 DD F0 FC
0859:07 20 D2 FF E8 4C 53 08 76
0861:20 E4 FF C9 85 F0 0F C9 2F
0869:86 F0 0E C9 87 F0 0F C9 3F
0871:88 F0 10 4C 61 08 4C A3 30
0879:08 A2 00 4C 86 08 A2 01 95
0881:4C 86 08 A2 02 BD FC 07 8C
0889:20 92 08 9D FC 07 4C 61 27
0891:08 C9 CE F0 07 C9 CD F0 EC
0899:06 A9 CD 60 A9 D6 60 A9 E9
08A1:CE 60 A9 93 20 D2 FF A2 8E
08A9:0E A0 00 18 20 F0 FF A2 D1
08B1:F0 A9 1F 20 64 09 A2 78 8F
08B9:A9 1E 20 64 09 A2 17 A0 12
08C1:00 18 20 F0 FF A2 00 BD 33
08C9:00 09 20 D2 FF E8 E0 2B DD
08D1:D0 F5 A2 00 BC 2B 09 C0 81
08D9:DD F0 0A BD 48 09 99 00 CB
08E1:D0 E8 4C D5 08 A9 C2 8D 75
08E9:F8 07 8D F9 07 A9 D9 8D A9
08F1:FA 07 A9 DA 8D FB 07 A9 38
08F9:0F 8D 18 D4 4C 75 09 92 22
0901:9F 46 49 53 48 3A 20 20 5E
0909:20 20 20 20 20 20 20 20 1B
0911:20 20 20 20 20 9E 46 49 92
0919:53 48 3A 20 20 20 20 20 12
0921:20 20 20 20 20 20 20 20 33
0929:20 20 00 01 02 03 05 07 90
0931:08 09 0A 0B 0C 0D 0E 0F 3B
0939:15 17 1C 1D 25 26 27 28 29
0941:29 2A 2B 2C 2D 2E DD 63 DB
0949:C8 ED C8 A3 A3 A2 97 A2 08
0951:97 A2 97 A2 97 FF 0C 0F D8
0959:00 01 00 03 07 0C 0C 03 5F
0961:03 03 03 20 D2 FF A9 12 14
0969:20 D2 FF A9 20 20 D2 FF 02
0971:CA D0 FA 60 AD 1F 03 F0 63
0979:06 CE 1F 03 4C 8F 09 A9 B2
0981:05 8D 1F 03 A2 00 20 33 16
0989:0A A2 01 20 33 0A 20 6A D7
0991:0F AD CE 02 C9 08 B0 0F 6F
0999:AD CF 02 C9 08 B0 10 A0 17
09A1:00 20 E4 0A 4C 75 09 20 63
09A9:EE 09 A2 14 4C B5 09 20 76
09B1:EE 09 A2 00 20 C5 09 A9 A5
09B9:00 8D 15 D0 A9 93 20 D2 8D
09C1:FF 4C 0D 08 A0 0C BD 98 52
09C9:07 49 80 9D 98 07 E8 E0 2F
09D1:0D F0 04 E0 21 D0 EF 8A EB
09D9:38 E9 0D AA 86 FB 84 FC F8
09E1:A0 9B 20 E4 0A A6 FB A4 05
09E9:FC 88 D0 DA 60 A9 0F 8D B9
09F1:15 D0 AD 10 D0 29 03 8D 38
09F9:10 D0 A9 06 8D 2A D0 A9 3E
0A01:03 8D 29 D0 8D 1C D0 A9 54
0A09:0C 8D 17 D0 8D 1D D0 A9 A2
0A11:CF 8D FA 07 8D FB 07 A2 4D
0A19:9B 8E 04 D0 E8 8E 06 D0 8A
0A21:A2 64 8E 05 D0 E8 8E 07 10
0A29:D0 A9 00 8D 01 D4 8D 08 67
0A31:D4 60 86 FE BD BE 02 F0 66
0A39:10 BD C4 02 F0 04 DE C4 97
0A41:02 60 20 05 0C 20 53 0A 54
0A49:60 20 EF 0A A6 FE 20 79 1F
0A51:0C 60 BD F8 07 C9 C2 F0 A0
0A59:26 C9 D4 F0 5B C9 DB F0 47
0A61:67 FE F8 07 BD FC 07 C9 32
0A69:D4 D0 03 20 97 11 B9 01 F3
0A71:D0 38 E9 04 99 01 D0 A9 95
0A79:03 A6 FE 9D C4 02 60 A9 0B
0A81:D2 9D F8 07 A6 FE F0 0D 16
0A89:A9 00 9D 7F 36 E8 E0 40 75
0A91:D0 F8 4C 9F 0A 8A 9D 40 C5
0A99:36 E8 E0 3F D0 F8 A9 00 D0
0AA1:A6 FE 9D AA 02 9D A8 02 01
0AA9:A9 3D 9D AC 02 A9 24 9D FC
0AB1:BC 02 20 22 11 4C 6F 0A 6D
0AB9:A9 DB 9D F8 07 A6 FE A9 57
0AC1:3C 9D C4 02 20 97 11 60 F5
0AC9:A9 C0 9D F8 07 A6 FE A9 A0
0AD1:00 9D BE 02 A9 CD 99 01 FD
0AD9:D0 60 A9 6E 20 D2 FF CA A1
0AE1:D0 F8 60 A2 00 CA D0 FD 9D
0AE9:88 C0 FC D0 F8 60 BD 00 E3
0AF1:DC 49 FF 29 0C 85 FB BD 85
0AF9:A8 02 F0 06 20 05 0C 4C DA
0B01:2D 0B 20 05 0C A5 FB D0 84
0B09:76 8A 49 01 AA BD F8 07 7B
0B11:C9 C2 D0 0A AD 1E D0 29 28
0B19:03 C9 03 D0 01 60 8A 49 78
0B21:01 AA A9 C8 99 01 D0 A9 40
0B29:C2 9D F8 07 E0 01 F0 ED 72
0B31:8A 49 01 AA BD F8 07 C9 53
0B39:C2 F0 E2 AE F8 07 AC F9 6B
0B41:07 8E F9 07 8C F8 07 AC 31
0B49:00 D0 AE 02 D0 8C 02 D0 17
0B51:8E 00 D0 AE 01 D0 AC 03 5B
0B59:D0 8E 03 D0 8C 01 D0 AD A0
0B61:10 D0 29 03 F0 0C C9 03 57
0B69:F0 08 AD 10 D0 49 03 8D EF
0B71:10 D0 AE 27 D0 AC 28 D0 66
0B79:8E 28 D0 8C 27 D0 60 A5 A6
0B81:FC 20 02 11 A5 FB C9 04 24
0B89:D0 3D A9 CD 99 01 D0 BD 99
0B91:F8 07 C9 C0 F0 05 A9 C0 DA
0B99:4C 9E 0B A9 C1 9D F8 07 F6
0BA1:E8 AD 10 D0 86 FB 25 FB 11
0BA9:D0 07 B9 00 D0 C9 18 F0 EF
0BB1:15 B9 00 D0 38 E9 03 99 D6
0BB9:00 D0 C9 FF D0 08 AD 10 4F
0BC1:D0 45 FB 8D 10 D0 60 A9 18
0BC9:CD 99 01 D0 BD F8 07 C9 04
0BD1:C3 D0 05 A9 C4 4C DB 0B 53
0BD9:A9 C3 9D F8 07 E8 86 FB DD
0BE1:AD 10 D0 25 FB F0 07 B9 AA
0BE9:00 D0 C9 3E F0 15 B9 00 A0
0BF1:D0 18 69 03 99 00 D0 C9 0C
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1019:C9 FA B0 44 60 A5 FD C9 96
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1031:02 A5 FC 4A 85 FD AE D1 53
1039:02 BD FC 07 A6 FD C9 CC 67
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1051:CA 02 60 AE D1 02 9D C6 E6
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14E1:1F 54 48 45 20 41 4E 47 F5
14E9:4C 45 52 53 DD 00 00 00 F7
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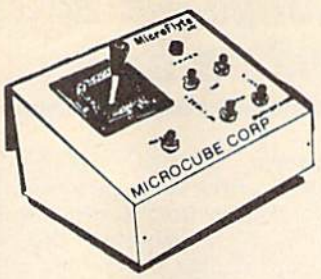

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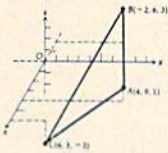

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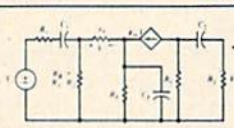

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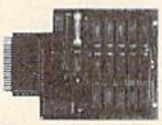

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MLX Machine Language Entry Program For Commodore 64

Ottis R. Cowper

"MLX" is a labor-saving utility that allows almost fail-safe entry of Commodore 64 machine language programs.

Type in and save some copies of MLX—you'll want to use it to enter future ML programs from COMPUTE!'s GAZETTE. When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

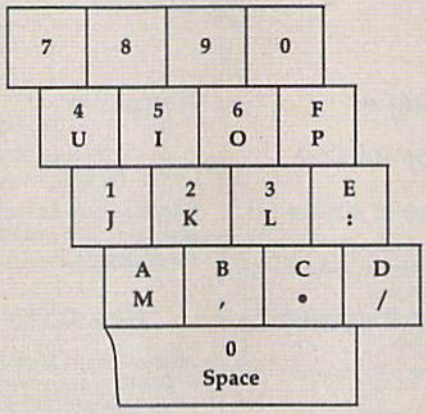
Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing.

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, the numeric keypad modification from the March 1986 "Bug-Swatter" column is now incorporated in the listing. The keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figure below shows the keypad configuration:



MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redis-

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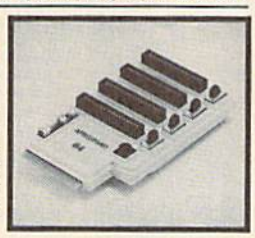

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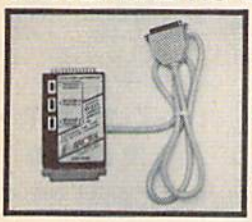

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played. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save. Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750), so this should *not* be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk or LOAD *"filename"* for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk or LOAD *"filename"*,1,1 for tape, and then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, and then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to insure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
      I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
      4=254:Z5=255:Z6=256:Z7=
      127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
      :BS=PEEK(55)+Z6*PEEK(56
      ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
      :S$=" ":D$=CHR$(20):Z$=
      CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
      +23:POKE I,0:NEXT:POKE
      {SPACE}SD+24,15:POKE 78
      8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
      R$(8):POKE 53280,15:POK
      E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
      {2 SPACES}{8 @}
      {2 SPACES}"SPC(28)"
      {2 SPACES}{OFF}{BLU} ML
      X II {RED}{RVS}
      {2 SPACES}"SPC(28)"
      {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
      {3 SPACES}COMPUTE!'S MA
      CHINE LANGUAGE EDITOR
      {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
      RESS{4}";:GOSUB300:SA=A
      D:GOSUB1040:IF F THEN18
      0
GF 190 PRINT"{BLK}{2 SPACES}EN
      DING ADDRESS{4}";:GOSUB
      300:EA=AD:GOSUB1030:IF
      {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
      R WORKSPACE [Y/N]{4}";A
      $:IF LEFT$(A$,1)<>"Y"TH
      EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
      ING...";:FORI=BS TO BS+
      EA-SA+7:POKE I,0:NEXT:P
      RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
      {BLK}{RVS} MLX COMMAND
      {SPACE}MENU {DOWN}{4}":
      PRINT T$"{RVS}E{OFF}NTE
      R DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISP
      LAY DATA":PRINT T$"
      {RVS}L{OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE
       FILE":PRINT T$"{RVS}Q
      {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
      MID$("EDLSQ",I,1)THEN A
      =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
      90,700,280:GOSUB1060:GO
      TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
      T"{DOWN}{4}ARE YOU SURE
       [Y/N]";A$:IF LEFT$(A$,
      1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
      LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
      =MID$(IN$,3):GOSUB320:A
      D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
      $(B$,J,1):B=ASC(A$)-C4+
      (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
      0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
      H$,B+1,1);:B=A-B*C6:PRI
      NT MID$(H$,B+1,1);:RETU
      RN
RR 360 A=INT(AD/Z6):GOSUB350:A
      =AD-A*Z6:GOSUB350:PRINT
      ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
      CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
```

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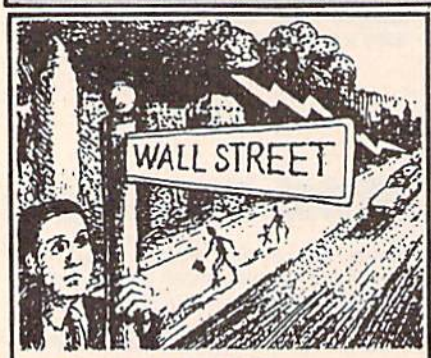
```
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
       [4]";:GOSUB300:IF IN$<>
       N$ THEN GOSUB1030:IF F
       {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
       {SPACE}":GOSUB400:IF IN
       $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
        THEN PRINT IN$:PRINT"
       {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$
       =S$:FOR J=1 TO 2:IF F T
       HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<
       24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A
       $>"@"ANDA$<"G")THEN540
GS 485 A=-(A$="M")-2*(A$=",")-
       3*(A$=".")-4*(A$="/")-5
       *(A$="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$=":
       ")-9*(A$="U")-10*(A$="I
       ")-11*(A$="O")-12*(A$="
       P")
CM 487 A=A-13*(A$=S$):IF A THE
       N A$=MID$("ABCD123E456F
       0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J
       =1)OR F)THEN PRINT B$;:
       J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF TH
       ENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
       ((I=0)AND(J=1))THEN GOS
       UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;
       :J=2-J:IF J THEN PRINT
       {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
       {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:INPUT#3,IN$
       :IF IN$=N$ THEN CLOSE3:
       GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
       MID$(IN$,I):GOSUB320:IF
        I<25 THEN GOSUB380:A(I
       /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
       B1060:PRINT"{BLK}{RVS}
       {SPACE}ERROR: REENTER L
       INE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
       R I=0 TO 7:POKE B+I,A(I
       ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
       LOSE3:PRINT"{DOWN}{BLU}
       ** END OF ENTRY **{BLK}
       {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
       {SPACE}DISPLAY DATA ":G
       OSUB400:IF IN$=N$ THEN2
       20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
        {RVS}SPACE{OFF} TO PAU
       SE, {RVS}RETURN{OFF} TO
        BREAK[4]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
       I=BTO B+7:A=PEEK(I):GOS
       UB350:GOSUB380:PRINT S$
       ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
       :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
       ENPRINT"{DOWN}{BLU}** E
       ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
       SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
       UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
       {SPACE}DATA ":OP=1:GOTO
       710
PC 700 PRINT"{DOWN}{RVS} SAVE
       {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
       NAME[4]";IN$:IF IN$=N$
       {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
       {RVS}T{OFF}APE OR {RVS}
       D{OFF}ISK: [4]";
FP 730 GET A$:IF A$="T"THEN PR
       INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
       ,15,"I0:":B=EA-SA:IN$="
       0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
       OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
       H*256):PRINT#1,CHR$(AL)
       ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
       R$(PEEK(BS+I));:IF ST T
       HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
       O940
GS 800 GOSUB1060:PRINT"{DOWN}
       {BLK}ERROR DURING SAVE:
       [4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
       OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
       $)+256*ASC(B$+Z$):IF AD
       <>SA THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:P
       OKE BS+I,ASC(A$+Z$):IF(
       I<>B)AND ST THEN F=2:AD
       =I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
       >0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN
        CLOSE1:CLOSE15:GOSUB10
       60:PRINT"{RVS}ERROR: "A
       $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
       187,PEEK(FA+3):POKE188,
       PEEK(FA+4):IFOP=0THEN92
       0
HJ 890 SYS 63466:IF(PEEK(783)A
       ND1)THEN GOSUB1060:PRIN
       T"{DOWN}{RVS} FILE NOT
       {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
       30):IF AD<>SA THEN F=1:
       GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
       2)-1:F=F-2*(A<EA)-3*(A>
       EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
       OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
       UB1010:ON OP GOTO950:SY
       S 63591
AE 940 GOSUB1080:PRINT"{BLU}**
        SAVE COMPLETED **":GOT
       O220
XP 950 POKE147,0:SYS 63562:IF
       {SPACE}ST>0 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
        LOAD COMPLETED **":GOT
       O220
DP 970 GOSUB1060:PRINT"{BLK}
       {RVS}ERROR DURING LOAD:
       {DOWN}[4]":ON F GOSUB98
       0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
       G ADDRESS (";:GOSUB360:
       PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
       AD=SA+AD:GOSUB360:PRINT
       D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
       ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
       *256):POKE193,AL:POKE1
       94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
       *256):POKE174,AL:POKE1
       75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
       1050
HA 1040 IF(AD>511 AND AD<40960
       )OR(AD>49151 AND AD<53
       248)THEN GOSUB1080:F=0
       :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
       {SPACE}INVALID ADDRESS
        {DOWN}{BLK}":F=1:RETU
       RN
AR 1060 POKE SD+5,31:POKE SD+6
       ,208:POKE SD,240:POKE
       {SPACE}SD+1,4:POKE SD+
       4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
       TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
       240:POKE SD,0:POKE SD+
       1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
       KE SD+4,0:POKE SD,0:PO
       KE SD+1,0:RETURN
```

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The Automatic Proofreader

Philip I. Nelson

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, and 16 and prevents nearly every kind of typing mistake.

Type in the Proofreader *exactly* as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, **10 PRINT"THIS IS BASIC"** will generate a different checksum than **10 PRINT"THIS ISBA SIC"**.

A common typing error is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you *run* any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP– RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, and 65526 for the Plus/4 and 16). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable *both* programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA+
   29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,136
   ,137
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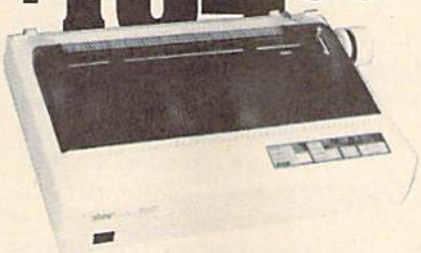

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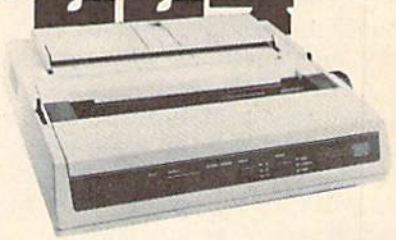

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How To Type In *COMPUTE!'s Gazette* Programs

Each month, COMPUTE!'s Gazette publishes programs for the Commodore 128, 64, Plus/4, and 16. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then on, erasing what was in memory. So be sure to *save a program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the *Gazette*, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT}, and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT + ↑	

For Commodore 64 Only

[1]	COMMODORE + 1	
[2]	COMMODORE + 2	
[3]	COMMODORE + 3	
[4]	COMMODORE + 4	
[5]	COMMODORE + 5	
[6]	COMMODORE + 6	
[7]	COMMODORE + 7	
[8]	COMMODORE + 8	

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